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A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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A Rotary Steam Snow Shovel.

Few winters pass without some railroads in the north and western States being for some part of the season blocked with snow, and when a severe winter comes round many roads are often obstructed for months. In the latter case the whole earnings of some roads are expended in the effort to keep the road open so that traffic can be carried on even in an irregular way. The cost of keeping roads open in such cases is simply enormous. Although ingeniously contrived machinery has been brought forth to aid human labor in the most difficult operations, the invention of machinery to aid railroad companies to clear away snow obstructions has proved singularly unsuccessful. All snow plows in use follow one idea, they ram into the drifts, and their efficiency in throwing the snow clear of the rails depends upon the speed of the engines that are pushing them. A less primitive or more dangerous way of performing a difficult mechanical operation could hardly be conceived. By extravagant expenditure of force such plows are made to open out light drifts, but heavy snow requires to be cleared by an army of shovelers, and plows of this kind can never be safely sent to operate on snow without being accompanied by numerous shovelers to dig them out when they get stuck fast in snow banks.

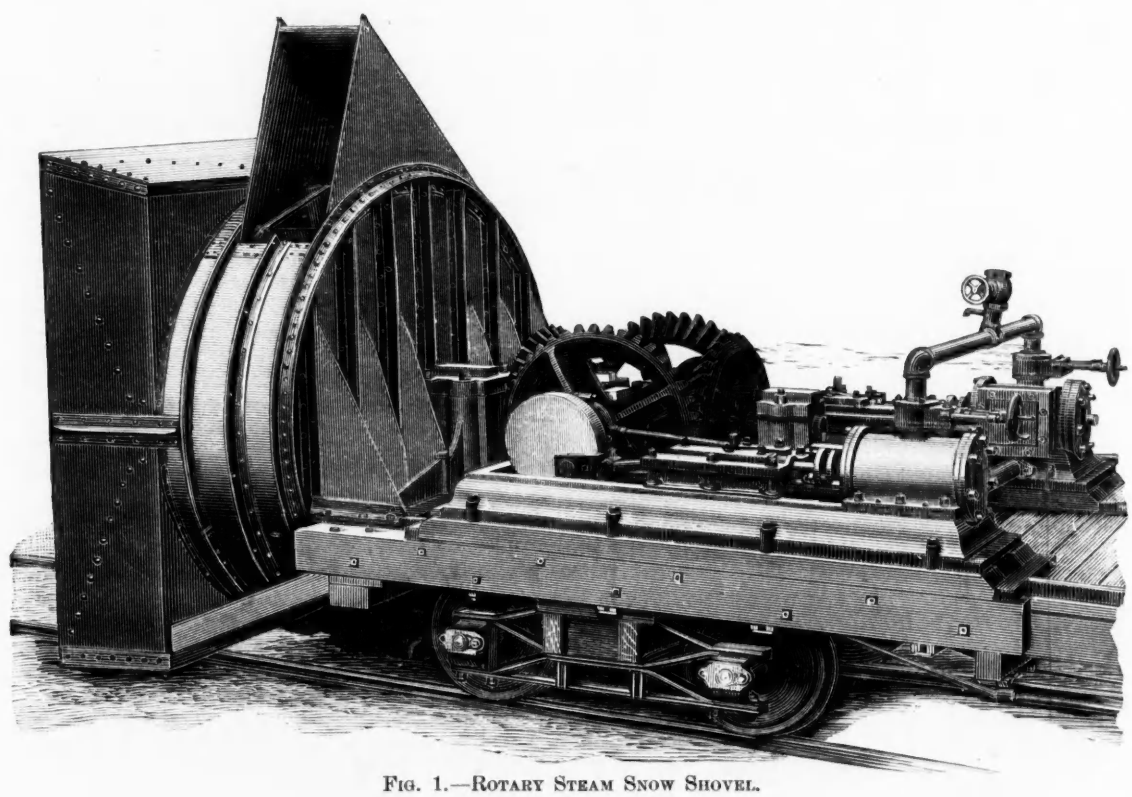


FIG. 1.—ROTARY STEAM SNOW SHOVEL.

We believe the machine illustrated in perspective in figures 1, 2 and 3 will effect a revolution in the methods of dealing with railroad snow blockades. The idea followed in designing this rotary steam snow shovel was to apply steam-moved machinery to performing the operation done on a small scale by the shovel in the hands of a workman. What is really a screw constructed like a huge post-hole cutter and operated in a similar way, is mounted on a strong steel plate frame that is pushed into the snow bank. The screw cuts into the snow, slicing away the drift with great velocity and throwing it into a revolving fan, which projects it through a shoot on top of the drum where the fan revolves and delivering it in a stream beyond the railway fence if needed to do so. The appearance of the screw as it does its work can be perceived by an examination of Fig. 2, the construction of the drum holding the fan and of the machinery that operates both will be understood by inspecting Figs. 1 and 3.

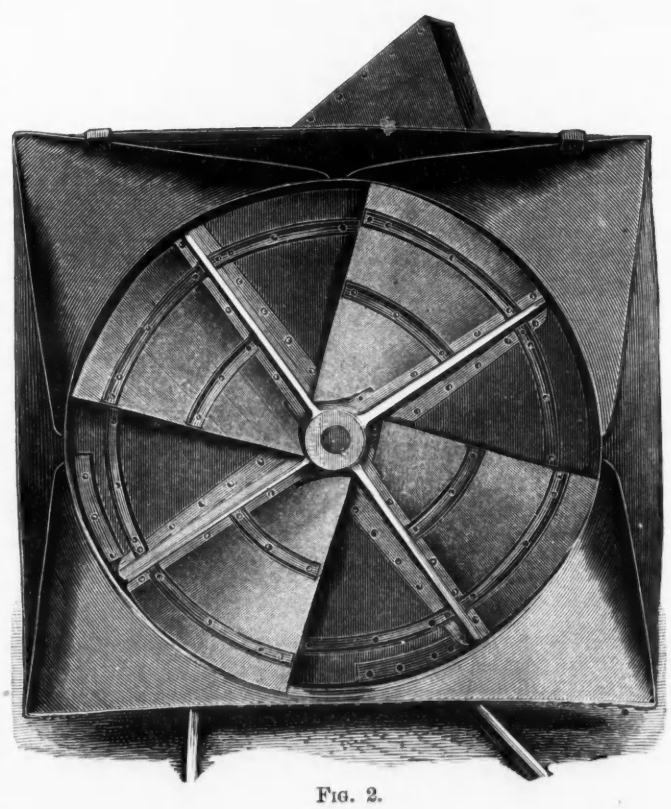


FIG. 2.

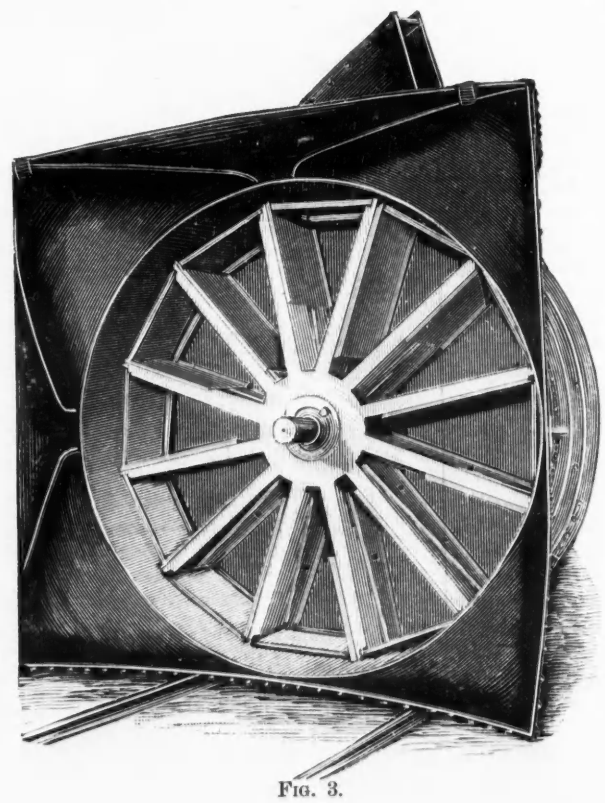


FIG. 3.

Power to operate this snow working machinery is supplied by a double cylinder engine which, with boiler, water tank and coal bunkers, is carried on a heavy double truck car. The cutting screw and the carrying fan are each fastened to a separate shaft, one of the shafts forming a hollow tube through which the other shaft passes.

The necessity for two shafts being used is, that the cutting screw and the carrying fan turn in opposite directions. The screw, in taking hold of the snow, puts it in motion in a direction opposite to that in which the screw is revolving. By arranging the fan to move so as to keep the snow going in the direction it has started, the high speed necessary for carrying the snow away clear of the track is easily obtained.

The duplex shafts are operated by a system of bevel gears driven by the engine, and the pull on the screw shaft is withstood by a long bearing with thrust collars resembling those used on steamers. One of these machines that was made early this year, and was tried successfully on a Canadian railway, has a cutting screw nine feet in diameter, and the engines were able to turn it between two and three hundred revolutions a minute. Other steam snow shovels to be made before winter will be made as wide as possible to pass bridges and platforms, and the engines will be made powerful enough to operate the screw at the high speed required to throw the snow clear of the track. Flangers, which are not shown in the cut are secured in front of the machine, and they throw the snow up to the screw so that the rails are left perfectly clean for the wheels of the engine that is pushing the machine. The front of the frame carrying the screw inclines outward at a sharp angle which will force the border of snow not cut by the screw into the center so that it will pass into the fan. The whole of the machinery, including boiler and coal bunker, will be placed under cover.

We know of no mechanical want that has been so severely felt for years as that which this rotary steam shovel is invented to fill, and there is a great future open for the machine if it fills the expectation of most practical railroad men who have examined it. The inventor was Orange Jull, a Canadian machinist, who worked for seven years before he got the idea worked to a practical conclusion. Officials of the Canadian railway where the first machine was tried, speak very favorably of its performance. It is intended to give a public test of the rotary steam snow shovel as early as possible this winter somewhere convenient to Chicago. The machine will be made and the patents controlled by the Rotary Steam Snow Shovel Manufacturing Company, Paterson, N. J., J. S. Leslie, President; George Cox, Secretary. Adaptations of this machine on a smaller scale have been designed for cleaning streets from snow, and machines similar to lawn mowers will be made for cleaning

sidewalks and such work. Those meant for this purpose will be light, and easily handled by one man.

Prospects of Young Engineers.

It will be found, and we say it with regret, that one reason why so many men are failures as engineers is that they do not take salable goods to market: and this opens up a very large question indeed. The question is one of education, the consideration of which we must reserve. We must, however, say that enthusiasts are running the risk just now of teaching young men intended to be engineers a great deal that has no direct money value whatever. Unfortunately, far too exalted an idea has been formed of the worth of so-called science to the steam engine maker, let us say. All the science in the world would not keep him out of the bankruptcy court unless he can sell engines for more than they cost him to make. We are not deprecating the teaching of science; we only insist that, in practical mechanical engineering, science does not of necessity mean money. We often hear German and French engineers extolled for the results of their scientific training. What are the locomotives or marine engines which have resulted from it like? The Americans have been the least scientific engineers in the world; yet they have modified engine-building practice all over the world. Germany and France have been unable to compete with us without buying engines from us to copy. Science may prevent a man from making enormous mistakes; it cannot tell him how to produce even moderate commercial successes. Standing alone, it is entirely helpless in commercial mechanical engineering—combined with sound practice it is useful. How and why some pupils learn the commercial part of the business, while others do not, and why some men have better chances of success than others, are points which we shall deal with at a future time. We have said quite enough now, we think, to open the eyes of some of our correspondents, to startle others, and to put a few, perhaps, in direct antagonism with us. We have said nothing, however, which any employer of labor, any practical mechanical engineer, will refuse to allow. Unfortunately, one of the first things the pupil discovers when out of his time is that, according to the world in which he seeks employment, he has really learned to do nothing which is worth substantial remuneration; and all the while employers are at their wits' end to get really good and valuable men.—*London Engineer.*

The competition between the Bessemer steel makers and the manufacturers of crucible steel is becoming increasingly severe. Rapid advances are being made in the quality of the Bessemer metal. This is amply illustrated by what is now going on at the colossal establishment at Barrow-in-Furness of the Barrow Hematite Steel Company, limited. In addition to an extensive output of rails, fish plates, railway tires and axles, square, round, and flat bars, hard and soft steel blooms and billets, suitable for steel and tin-plate making, etc., and such like heavy productions, the company are regularly making upwards of 1,000 per week of "special" steel, for purposes for which only Swedish Bessemer, charcoal, and best scrap iron were formerly considered suitable. This special steel is being worked up in various parts of the kingdom into roll-turning and lathe-turning tools, chisels, files, shear blades, rail drills, rail punches, shear steel for welding to iron, miners' drills and tools, picks, shovels, hand hammers, roller, bar, and cotton spindles, locomotive engine, wagon, carriage, coach, and furniture springs, bolts, nuts, rivets, pit ropes, telegraph, crinoline, and corset wire, umbrella frames, wire for musical instruments, etc. Indeed, the steel is suitable for the manufacture of cutlery and razors, and is to some extent being used for these purposes. A test of the quality of the soft steel, as manufactured for pit chains, is afforded in the circumstance that a one-inch chain has, under test, withstood a breaking load of 35.63 tons; elongation 6 or 18 inches.—*Sheffield* (Eng.) *Telegraph.*

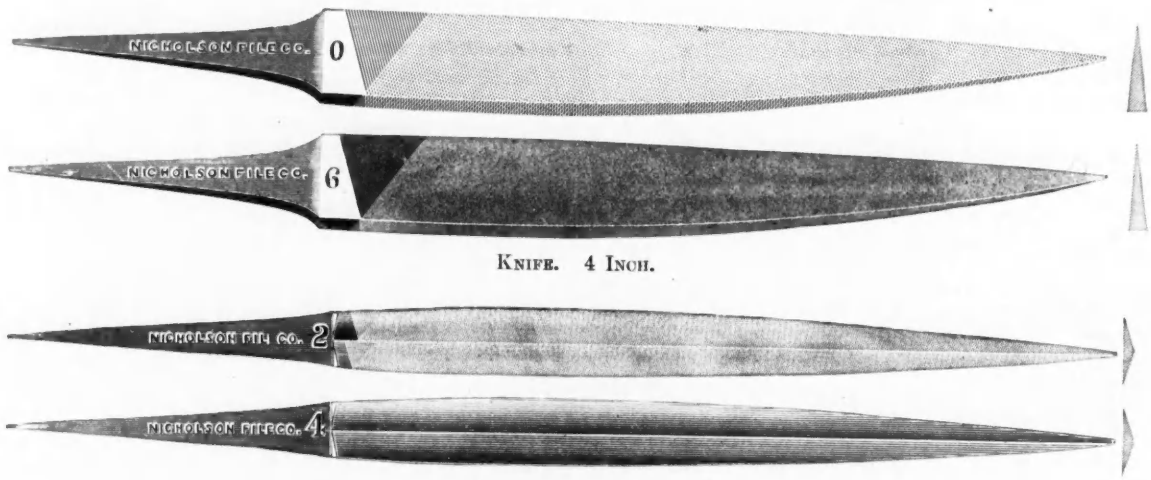
Arresting Decay of Wood.

Professor P. H. Dudley, well known to raiload and scientific men in connection with his discoveries made by aid of the dynagraph car of his own invention, has been for some time investigating the cause of the rapid decay of wood. His methods of investigation have been mostly microscopic and chemical. Some time ago he discovered the fungi that caused the premature decay to most of the woods used in railroad structures, and followed their operations on the cellular structure of the wood. By use of the photo-micrograph, a method of photographing microscopic views he kept a graphic record of the appearance of decaying wood tissue. After patient search Mr. Dudley has discovered the spore that acts as the seed of fungus, and he expects soon to provide a means of destroying this seed before it produces growth. Some of the wood preserving methods in use do not destroy the fungus spores, and they go on germinating their ruin making fruit. Any sure means of arresting the premature decay of wood will prove exceedingly valuable to railroad companies since bridges and ties often fail with half their natural age, and in failing often bring about disastrous consequences.

A Long Train.

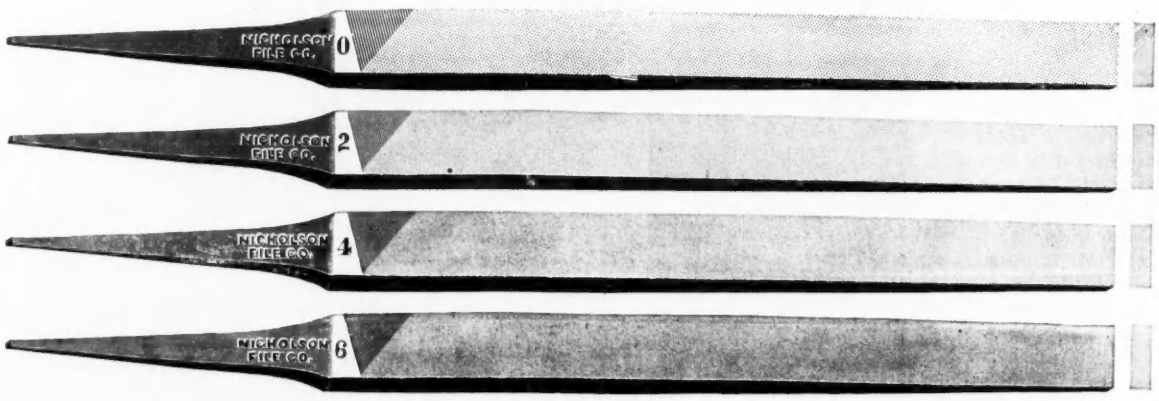
Southern railroad men are disposed to exhibit the rooster over the recent performance of a small Baldwin eight-wheel locomotive on the Morgan, Louisiana and Texas Railroad. There was a great rush of cars going towards New Orleans, and the road being short of motive-power this engine was coupled to a train of 105 freight cars, 82 of which were loaded, 23 empty. The train was fully three-quarters of a mile long, and was hauled a distance of eighteen miles, at the rate of twelve miles an hour, without stopping. The weight of the train, exclusive of the engine, was reported to be 1,992 tons If the figures reported to us are correct, the engine must have developed extremely high tractive power for its size. Allowing five pounds per ton for train resistance, which is a low figure, the locomotive must have exerted about 10,000 pounds tractive force on the rails to move engine and train. We have seen longer trains than this pulled by a 16x24 locomotive, but the cars were mostly empty. If any one of our readers know of cases where this feat of the Morgan line engine was e ualed, we would like to hear he particulars.

The mechanical department of the New York elevated railroads are equipping one of their locomotives with the Grosbeck & Wright spark arrester. This patent device for preventing the emission of sparks is in use on several engines belonging to the Pennsylvania Railroad, the Erie, and other prominent roads, and is a most successful appliance for the purpose. A small tank is carried in the smoke-box, into which all cinders carried through the tubes are thrown. After going through that bath, there is no fear that they will start any fires. We have carefully watched the working of a locomotive having this arrester on, and could see no sparks thrown.



KNIFE. 4 INCH.

BARRETTE. 4 INCH.



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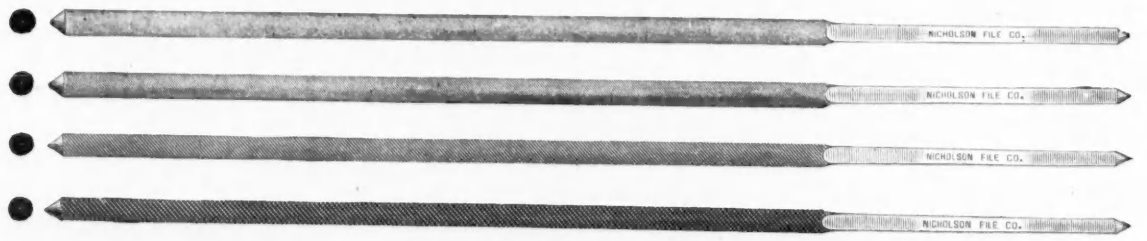

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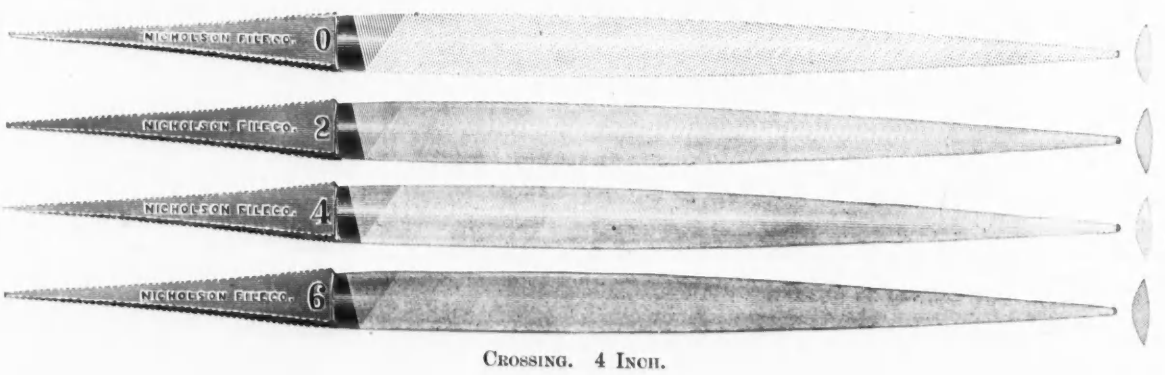


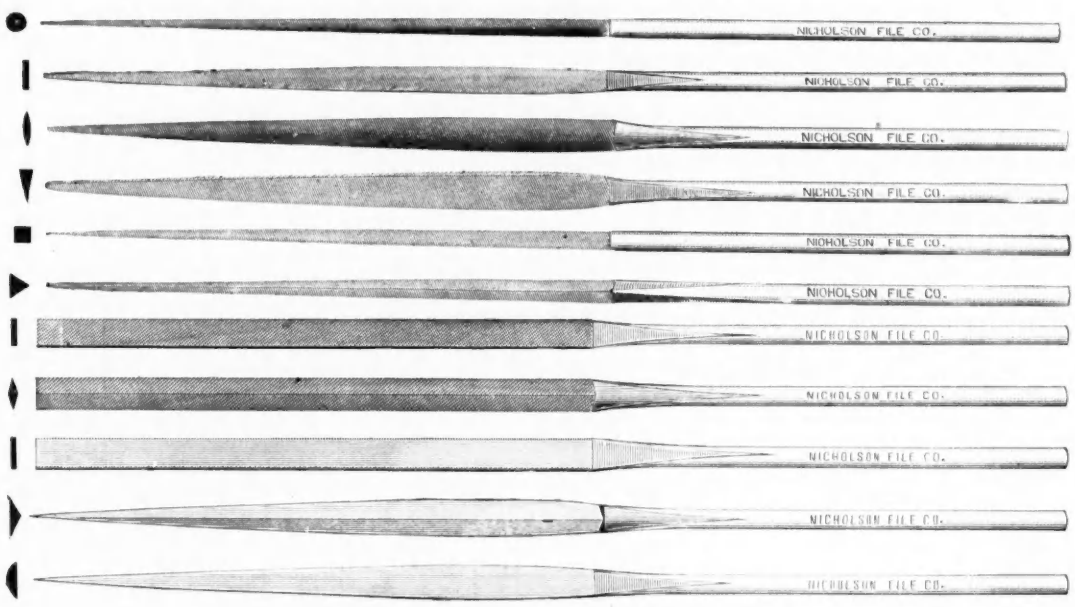
CROSSING. 4 INCH.

Machine-Cut Swiss Pattern Files.

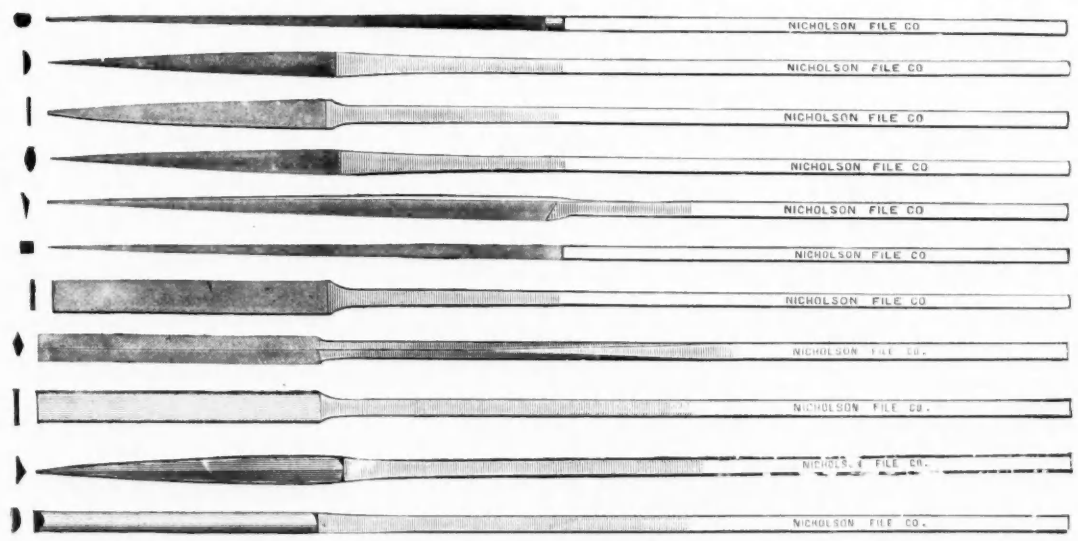
It is only a few years, comparatively, since the manufacture of machine-cut files was established in this country, and then the opinion was quite general that such files would not to any great extent supplant the hand-cut article, even for the more common purposes for which files are used. But they have worked their way into popular favor against prejudice, until now they are found in use in every machine shop in the country. While, however, the success of machine-cut files for ordinary use has become firmly established, there has, until recently, been one branch of the business that did not seem

likely to be affected by the use of machinery, viz.: the manufacture of extremely fine and delicate files, very commonly known as Swiss files. These files, it has been claimed, could not be successfully cut by machinery —that they required the delicate hand touch of the skilled operator. Thus, while American manufacturers were able to supply the home market with the ordinary grades of files, they could not, owing to the higher price of labor, manufacture the higher grades in competition with foreign manufacturers. Cutting some of the delicate Swiss pattern files by machinery would seem to be a greater advance, in mechanical refinement, over cutting the ordinary grades, than the advance made a few years ago to making watches by machinery, by which the watch trade of the country was revolutionized, was over ordinary machine-shop practice. But the advance has been made, and at the present time all classes of Swiss pattern files, some of them scarcely larger than a large needle, are cut by machinery with a degree of refinement almost incredible.

As illustrative of what has been done in this direction, we give room to some engravings, representing a few of the forms, made in great variety by the Nicholson File Company, Providence, R. I., merely premising that, while the engravings give a good idea of some of the forms made, it would be impossible for the engraver to correctly delineate the extreme accuracy of cut, which can only be appreciated upon an examination of the files themselves. Establishing the manufacture of this grade of files in this country is equivalent to establishing a new industry, since they are extensively used by jewelers, watch-makers, tool-makers, and in fine machine work generally.



ROUND HANDLE NEEDLE. 5½ INCH.



SQUARE HANDLE NEEDLE. 5½ INCH.

The *American Journal of Railway Appliances* pathetically wails for a much-needed reform on the elevated railroads of New York. The *Journal* man has got cramp in his neck twisting his head out of windows trying to find out the name of the station, and he wants station indicators put in the cars or the voices of the brakemen rebuilt. Having endured similar discomfort, we cordially echo the wail.

A Happy Thought.

This week's issue of the *U. S. Sewing Machine Times* has the following:

Very True.—Said a master mechanic of New York to a question being put to him concerning the relative cost of machine work, and hand work thus: "I have tried all ways of running a machine shop, and I find that the cheapest way to get out work is to use the best tools made, and keep them in good order; then, when I tell a man to do a job, I expect it to be done in first-class style, or I know who is to blame. When I have a poor tool in the shop, however, and a man turns out a bad job of work from it, I cannot say a word of reproof, for he is ready to retort, 'well, look at the tool I have got to work with,' and the reproach comes back to myself."

The above impressed us as being a happy thought the moment we saw it in the pages of our esteemed contemporary. Another moment's consideration convinced us that it *must* be a happy thought. At least, we thought it happy when we published it in our issue of week before last, the remarks quoted being part of a conversation between a representative of the AMERICAN MACHINIST and William Münzer, the well known engine builder of this city.

Steam that does not carry more than three per cent. of water is considered "dry steam."

The Waldron Rotary Engine.

We recently spent an afternoon cruising in New York Bay in a steam launch belonging to E. W. Bliss, of Brooklyn, which was propelled by a rotary engine brought out by the proprietor of the boat. This form of engine, being very compact and easily handled, is particularly suitable for supplying motive-power in such places as small yachts, where every inch of room is valuable. The cylinder, which incloses the whole engine, is placed abaft the boiler, and the starting valve, which also reverses the motion, is operated by a lever beside the engine. Besides that of compactness, the claims made for the engine are its reliability, which keeps it ready for work whenever called upon; it has no valves to stick or get out of order, no dead center, no trouble with water in the cylinder; it does not require an experienced engineer to run it; the engines are durable, reliable, with greater strength and less material than corresponding reciprocating engines; they cannot be thrown out of adjustment, nor can they be broken by any ordinary usage to which engines are generally liable; the friction is light, and the wear correspondingly less, and it will keep steam-tight. During the whole of the cruise the engine propelled the boat very fast, and Mr. Bliss claimed that the work was done with less steam than other engines had used to run the boat. We illustrated this engine as then constructed in the AMERICAN MACHINIST of July 30, 1881, one of them having been in use by Edward Waldron, the inventor.

In the line of internal improvements in France, the need of better agricultural implements is receiving prominent attention. Nearly all districts still use very primitive means of cultivating the soil, but many of them are moving slowly towards modernized implements. The ancient sickle cuts a great part of the grain raised, but many of the local authorities are encouraging the use of reaping machines, and public exhibitions are held, where prizes are awarded to the machines that do the work most satisfactorily. In several competitions that were lately made with twine binders, the McCormick, exhibited by a firm handling American goods, took the first prizes.

A New Explosion Danger.

Sir Edward Watkin, the chairman of the English railway where the recent terrible accident happened when twenty-five persons were killed, has discovered a new danger about the Westinghouse air brake. This brake, he explained to his associates of the board of directors, is operated by an air pump working at a pressure of ninety pounds to the square inch. This pump, he said, is on the engine, and if it (the pump) were to explode, the result would be disastrous! Profound ignorance of this kind is ludicrous, especially when found in high places amidst those who presume to be more enlightened than their less exalted countrymen.

The *Mexican Financier* says: "The dwarf coco grows abundantly everywhere [around the city of Tepic]. From its rich kernel the finest lubricating oil known is extracted, as well as the base for a soap, whose appearance and excellence would meet with universal favor. Why some one has not amassed a fortune from the manufacture of this oil here is one of the many mysteries of favored Mexico. On the low lands, cotton, sugar cane, coffee, corn and tropical fruits are easily grown, while the elevated plateaus and valleys yield a magnificent grade of wheat. And yet, strange to say, in this populous section, constantly traveled, not a single flour or grist mill is to be found nearer than Guadalajara, two hundred and fifty miles from the coast."

A correspondent would like to hear from some reader of the AMERICAN MACHINIST of a cheap plan for bronzing cast iron radiators, the bronzing to be reasonably durable.

Boiler Construction.

BY GEORGE MARSHALL.

In a large number of boiler shops but little attention is given to the "rounding up" of the cylindrical shells of boilers; in other words, there is little or no attention given to the fact that to produce the greatest strength the cylindrical portions of a boiler should be as near a true circle as it is possible to form them, and that this should be done with as little strain on the plates as possible. The custom of rolling the circles into elliptical rather than spherical form is practiced in many shops, and resort is then had to the maul of wood, or hammer of steel, to produce the effect aimed at, namely: a true cylinder. My experience and observation justify me in saying that 80 per cent. of the cylindrical boilers in use at the present time were originally defective in this respect, and this defect is of great importance in determining the safety of a boiler and the pressure which may be carried with safety, as any deviation from the true circle must of necessity result in a weakening of the general strength by the introduction of an element of weakness in the elliptical, oval, or other forms, than that required. Due attention should be given to the rounding up of the lap portions of each sheet; the custom prevailing is to allow that portion of the shell to remain flat. This straightening of the curve to a straight line is also often caused by the carelessness of the riveters, and in machine riveting by the neglect of the man in charge of the machine.

The effect of pressure on a boiler shell, where a departure from the circle has been allowed and the longitudinal seams left straight is to cause the seams to assume the form originally intended, when pressure is applied, thus producing an excessive strain on the rivets and caulking at the laps, resulting in a sprung and leaky joint. This is, in part, remedied (and only in part) by the re-caulking of the seam, when prudence and safety would suggest removal of rivets, rounding of flat surface, having new rivets put in, and the seam properly and carefully chipped and caulked. This would require an exposure of the careless habits of the foreman and workmen, entail an additional expense, and is never followed. It is well known that a mechanically true circle cannot be produced where the longitudinal seam overlaps, but care should be exercised to preserve as near an approach to it as the nature of the material will allow.

Welding as a substitute for longitudinal riveted seams has been recommended by engineers in order to produce a circle the strength of which would be equal in all its parts, uninjured by punching and drifting, and capable of sustaining the load or pressure equal to the calculated strength of circle in proportion to diameter and thickness. The distortion which takes place in the internally or externally fired boilers from the application of the requisite heat to generate steam, even under the most perfect forms, is considerable. That this distortion may be greatly and dangerously increased by improper construction is an undoubted fact. Where the form is in part elliptical, if the major axis is parallel to the action of the fire, it follows that the tendency, owing to weight of water, pressure and increased ductility of material will be to restore the true cylindrical form to the lower part of the shell. The upper part, not being equally affected by the heat, will not be as fully acted upon as the lower, and undue expansion and contraction will result, and the tendency to channel at the seams be greatly

increased. Were the minor axis similarly exposed the effect would, perhaps, be more injurious, as the heat would cause a weakness at bottom, and additional distortion, which would, were the longitudinal seams affected, in time result in rupture.

The practice of putting three or more brackets or lugs on each side of the horizontal tubular boiler is not productive, in all cases, of the best results, as the intense heat to which the bottom of boiler is exposed must, of necessity, result in greater expansion at that point than at the top, and the result is a crowning of the shell from this cause, throwing the entire weight of boiler on the unaffected brackets, which, where so many are used, are not of sufficient strength to safely carry the load. When two brackets are placed on each side, and expansion takes place, the center of boiler being affected, still allows the brackets to carry the weight without risk. Of course, where but two brackets on each side are used, they should be of sufficient strength to carry the weight of boiler and contents, and the rivets should also be correspondingly proportioned. In all cases the back lugs should be placed on rollers, to facilitate the expansion which must necessarily take place. Not less than three rollers should be placed under each of the back lugs, but five are much better than three. When expansion takes place, and the boiler is supported as described, the curvature of bottom may throw the face of the lug out of line, but it remains supported on the rollers. When contraction takes place the boiler resumes its original position.

Many boilers are injured in manufacture by a deficiency of braces; many more are injured by too many braces. Anything which allows an excessive strain from expansion to take place in the tubes must, of necessity, be injurious; on the other hand, if the flat ends or heads are not sufficiently braced, a strain occurs at the root of flange, and this strain, with expansion and contraction, eventually leads to a fracture, at first imperceptible, but in time becoming visible and dangerous. When the single end flat brace is used, it is the custom, in some shops, to carry a row of such braces close to the tubes, and these braces are slightly bent over the anvil before being put in, to allow, as a foreman recently told me, "for their straightening with the expansion of the tubes." But how they were to resume their original form after straightening was not explained to me, and I must confess that this "*kink*" in boiler making is not yet understood by me. The question is, how can any man understand just how much curve is required in a piece of flat bar iron to correspond with the expansion of the tubes, and yet allow a sufficiency of strength to resist internal pressure, and leave the brace yielding enough to resume its original form after the pressure has been removed or reduced? A too rigid bracing in the ordinary tubular boiler throws the strain on the tubes; a too yielding system throws the strain on the flange. Experience and study can only enable the boiler builder to arrive at the due proportion required to produce the most satisfactory results. The safety of any boiler depends on its ability to carry a given pressure from day to day, allowance of course being made for deterioration from age and other causes, but as the safety is calculated from a near approach to regularity in form and proportion in bracing, it follows that too much attention cannot be given to these subjects. That they are not as carefully considered as they should be is manifest to any intelligent mechanic who scrutinizes the methods employed in different boiler shops.

The length of braces used to secure the heads of boilers to shell is, in many cases, insufficient, as it is a well-known fact among intelligent workmen that the diagonal brace is not equal in strength to the longitudinal one, and the tension is greater on the former than on the latter; hence the nearer we approach in the diagonal brace (by increased length) to the longitudinal, the more we add to the safety of the flat surface, and the closer we can compute the strength of the diagonal braces in proportion to the tensile strength of the metal of which they are made. The parts of the head nearest to the flange do not require a brace of extraordinary length, but the part where the strain is greatest requires all the strength possible, yet allowing a margin in all cases for the yielding of the head between the brace proper and the tubes or flues to conform to the increased length of same by the expansion which takes place. In my own practice (where allowed to brace in accordance with my own views), the distance from center to center of braces is first computed in proportion to the pressure required, and I then leave a corresponding space from the center of braces to the edge of upper tubes, that is for ordinary pressure, the distance thus left affording a yielding surface sufficiently flexible to correspond to the expansion of the tubes, allowing the head to yield sufficiently and yet resume its original form after the pressure has been reduced. By this means the tubes, acting as braces, are made to do part of the duty of staying the flat surface, and the difference between tubes and braces proper allows sufficient for expansion, and permit the heads on contracting to resume their original form. In practice, I place my braces equi-distant in themselves, and radially, struck from the same center as the flange—in other words, the true center of boiler. Where "tee" or "angle" iron is used on the head, it should radiate to the main center, thus preventing the necessity of twisting the brace at shell end. The custom of fitting the braces when hot, and allowing the difference between the marks made when heated and the contraction which takes place when cold to insure uniformity in the "pull" or strength, is not to be relied upon, as the holes are not uniformly cut where marked; or, if correctly cut, the variations in temperature of each brace will prevent the end aimed at. I think it the best plan to punch braces, and in fact, all holes in the straight sheet, saving time and labor in the operation. The use of the "spiral" punch in the manufacture of steel boilers, except where recourse is had to drilling, should receive attention from boiler builders, as by its use the metal is injured much less than where the common punch is used. Experiments have demonstrated that by its use the metal will stand a pressure of 2½ tons more than where the flat punch is used.

In the preparation of specifications no attention is given to these subjects, leaving bracing and kindred matters to the judgment of the builder, whose sole object is to get his work done in the cheapest manner possible. In boiler building, as in the erection of buildings, the plans and specifications should be entrusted to a competent, experienced man; experienced, not in theory, but in practical application of such methods as may result in efficient economy and maximum of strength, at the same time continuing his services until the work has been completed and approved, as in the case of architects employed to design important edifices, whose services are continued, and whose approval must be obtained before the builder will receive his price for the work done. How much more necessary is this supervision in the case of a steam boiler, liable as it is, when improperly constructed, to scatter death and desolation in its immediate neighborhood! Yet the custom is to dispense with the services of engineer or draftsman as soon as the boiler plans are prepared, leaving the construction to take care of itself.

It has been asserted in my hearing that "Inspectors can be bought." While this may be true, my impression is that the price of any engineer or inspector engaged in boiler supervision is far in excess of any profits to be made from any boiler contract, and suspicion of this nature is liable only to spring from the heart or brain of a man who knows his own weakness. For my own part, and of my own knowledge, I can bear evidence in favor of inspectors and engineers employed in this class of work, and, while personally acquainted with many of the craft, have never yet found one small enough to sell his principles for pecuniary or other reward, and my impression is that they are as little liable to purchase as the architect, whose integrity is seldom questioned.

Since the Franklin Institute reported on the metric system of weights and measures, and showed plainly the enormous expense and incalculable inconvenience that would be endured in this country, in changing from our established standards to the French system, the enemies of our weights and measures have been very quiet, but it is said they are striving quietly but vigorously to commit this country authoritatively to the metric system. Mr. Stephen M. Chester,

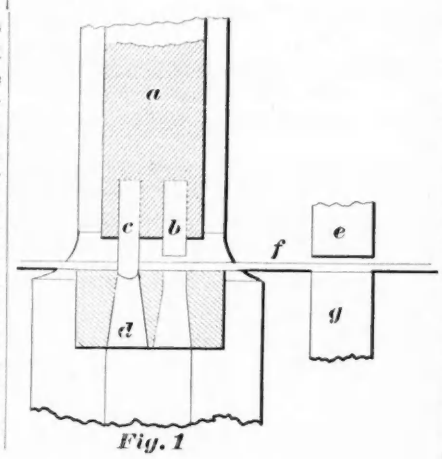


Fig. 1

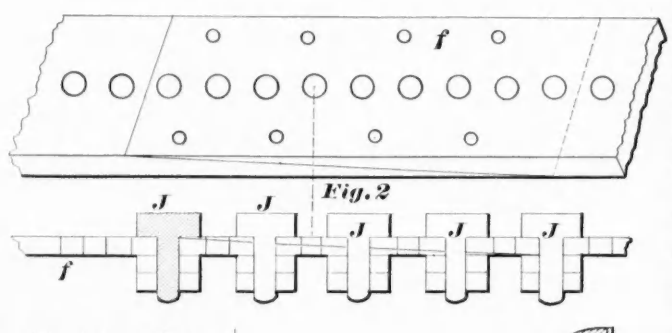


Fig. 2

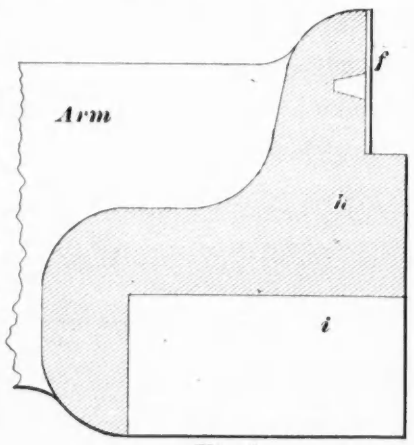


Fig. 3

chairman of the New York branch of the International Institute for Preserving Anglo-Saxon Weights and Measures, has sent an open letter to President Arthur, requesting that those who oppose the introduction of the metric system into this country may be represented in the International Congress, to be convened at Washington next October. The ostensible purpose of this Congress is to determine a standard or prime meridian, but it is understood that an attempt will be made to commit this country in favor of the metric system.

We have received from Root & Tinker, at the instance of R. Hoe & Co., a copy of a fine large engraving, entitled "Representative London journalists." It shows portraits of a group of the leading London editors, and is quite creditable to the publishers.

A correspondent who contemplates building, would be glad to get the views of some of our readers who have had experience as to the best and most durable flooring for the ground floor of a machine shop.

How to Originate a Scale of Equal Parts.

BY F. G. WOODWARD.

If there is any one that believes in perfection in mechanical manipulation, and who has an ambition to try his hand in that line, I can think of no piece of work in which he would be so likely to succeed as in originating a scale of equal parts, provided he utilizes every element of success at his command as he proceeds in the work. The process here presented is not new, but it is capable of some refinements, which, it is believed, have never been fully utilized. The outfit for the job, in the way of tools and material, is quite simple and inexpensive, consisting of a small punching tool, of which Fig. 1 represents a sectional plan of its chief parts, and a strip of metal *f* of uniform thickness and width, and of any desired length of scales. The plunger *a* carries a punch *b*, and follower *c*, of equal size, placed as closely together as practical—say, ¼″ between centers. The follower should have sufficient length to enter the die *d*, as shown, before the punch makes its hole. The tool may be worked by hand, or (by the addition of a single shaft and a single cam) it may be worked automatically by power. If it is to be worked automatically, five motions only will be needed. First, the downward thrust of the plunger, which punches the hole; second, the lateral motion of the tool with its work, the distance being just equal to that between punch and follower; third, the motion which brings the clamp *e* upon the strip *f*, and holds it upon the block *g*; while the fourth motion withdraws the punch and follower from the die. The fifth motion returns the tool to its first position, this process being repeated till the desired length of scale is punched. The cam must be so adjusted as to release the clamp *e* just before the follower *c* enters the hole, so that the distance between the holes may be regulated entirely by the follower. If a strip of iron or steel is used for the scale, it should be placed in a bath of dilute nitric acid to remove the crust of oxide from its surface, and then it should be washed in hot lye water, and oiled before it is punched, in order to insure the integrity of punch and die. If the scale is to be used as a gauge by which to cut the teeth of a dividing wheel of a gear-cutter or graduating machine, it should contain a few extra holes to insure accuracy in joining the two ends, as the coincidence of several pairs of holes is a more satisfactory guide than the coincidence of a single pair.

A plan of this joint is shown in Fig. 2. drawn to double the proper thickness, in order to show clearly its construction. It will be necessary to have a few nicely-fitted bolts exactly the size of the punch and follower, with large heads, as shown at *J*, to hold the lap joint in place while being fastened. The inner face of the head and nut must be perfectly square with the body of the bolt.

The size of the wheel upon which the punched scale is to be used is best determined by the number of holes in the scale. If the scale contains 500 holes, for instance, the diameter of the wheel must be (500÷3.1416=159.15) equal to one hundred and fifty-nine divisions, and fifteen one-hundredths of another. If the punched scale is used upon the dividing wheel, the rim of the wheel may be formed as shown in the cross section, Fig. 3. A channel should be cut beneath the punched gauge *f*, opposite the holes, as shown, so that the gauge stops shall not bottom. That portion of the rim, *h i*, in which the teeth are cut, should project beyond the scale, as represented, so that the cutter shall not strike the scale while cutting the teeth. After the teeth are cut, the ring *i* may be moved half a revolution, and then fixed permanently to the rim proper, *h*, placing the teeth of one opposite the spaces of the other. If, while moving the ring half a revolution, the teeth of the two portions of the rim, *h* and *i*, match each other perfectly in every position, the job may be pronounced satisfactory, as far as the scale of equal parts and rim of the wheel is concerned. But the workman who understands this job should

understand at the beginning that it will require considerable resource of brain and hand to complete the job with sufficient accuracy to stand the test just stated.

It is immaterial what number of teeth a dividing wheel contains, provided the number is a large multiple of other numbers, because any number desired may be thence produced with the agency of the differential arrangement explained in the AMERICAN MACHINIST of October 15, 1881.

In the United States of Colombia mining seems to be carried on in an exceedingly primitive fashion. In a paper read before the American Institute of Mining Engineers, by John H. Hammond, he says that negro women are the principal miners in the mining districts of Colombia, and that the tools they use are a crowbar and an implement with a large steel blade, bent and pointed, which acts the double part of pick and shovel. Ordinary aids to mining, that in other countries are considered absolute necessities, even in crude operations, are here unknown. Many of the mines are rich in different ores, and would yield good returns if they were properly worked.

From Mr. G. W. Tilden, superintendent of motive-power and machinery of the Chicago and North-Western Railway, we learn that he has the locomotive at work which was recently built by the Brooks Locomotive Works, with the Coventry return flue boiler. Some changes had to be made on the grates and other appliances, with which the engine was equipped, to render it suitable for service with the coal used by the Chicago and North-Western Railway. The engine works satisfactorily, but sufficient data have not yet been collected to compare its performance with that of the standard locomotives. The engine will have to do well to make a favorable comparison alongside other engines on this line, which for years has been noted for the economical record of its locomotives.

LETTERS FROM PRACTICAL MEN.

Proportioning Slide Valves and Determining the Effect of Different Proportions.

Editor American Machinist:

Referring to a former letter, it will be seen that I gave one method of finding the average points of cut-off, release, etc., of the slide valve.

The diagram, Fig. 4, shows an equally simple method of determining the various points for forward and back stroke, when the length, or relative length, of the connecting rod is known.

In Fig. 4 the same diagram is given as before, with the addition of the two diagonal dotted lines, which show the point of cut-off and release of the return stroke. In place of the vertical lines shown in Fig. 3, circular arcs are substituted. These arcs are struck from the center line B, with a radius which bears the same relation to the connecting rod as the large circle does to the piston travel of the engine. That is, if the connecting rod is three times as long as the stroke of the engine, then the radius or distance from K to L is three times as great as the diameter of the circle A, the same radius being used for striking all the arcs.

It will be seen that, while the crank travels the same distance from the commencement of the stroke to the point of cut-off for each end of the cylinder, the piston does not travel the same distance in the cylinder, the cut-off taking place, as shown, at about $9\frac{1}{4}''$ piston travel in the end of the cylinder farthest from the crank, while at the other end the travel is but about $8\frac{1}{2}''$. The exhaust opening and closing are also unequal. These are defects in the direct connected valve motions which are, to a certain extent, corrected by differential valve motions.

This form of diagram furnishes a ready means for drawing ideal indicator cards direct from the valve motion diagram, as shown by Figs. 5 and 6, Fig. 6 showing three different cards, one being at $\frac{3}{4}$ cut-off and positive lead, one at $\frac{3}{8}$ cut-off and no lead, and one at $\frac{1}{8}$ cut-off and negative lead, there being in neither case inside lap to the exhaust edges of valve.

This last diagram assumes that the cut-off is shortened by increasing the lap, and only shows what can be done with valves of different lap having the same travel. What really takes place in many of the late single-valve automatic engines is the shortening of the travel of the valve, the lap of necessity remaining the same; and this diagram does not show the actual port openings as they exist when cutting off shorter, but that also may be shown by a slight change in the diagram.

JOHN E. SWEET.

The Perfect Screw Problem.

Editor American Machinist:

In reading Prof. Sweet's article of July 19, I supposed his intention was to cut both long and short screws by the same arrangement.

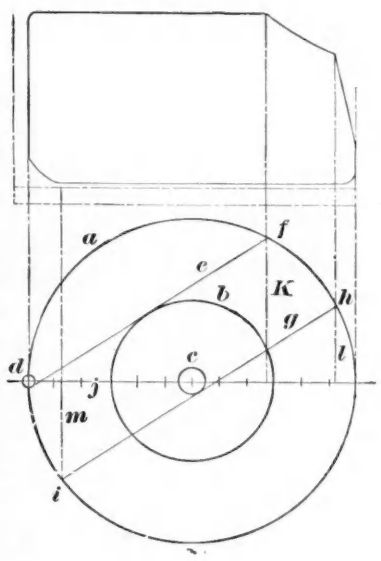


FIG. 5.

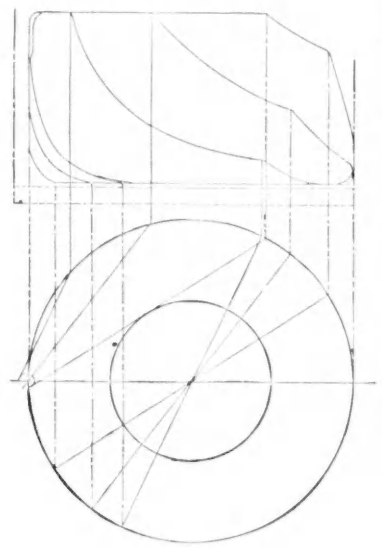


FIG. 6.

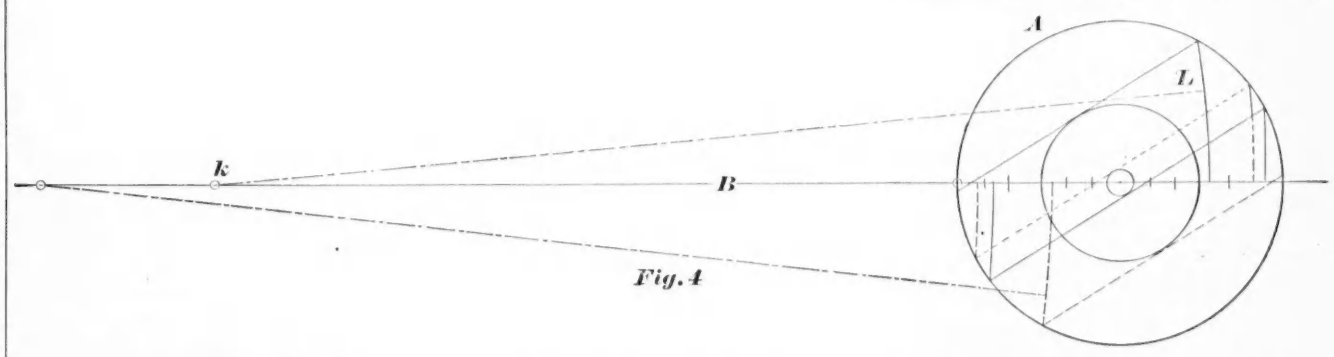


Fig. 4

My understanding of the matter was this: To cut one length 16″ or 18″, open the nut, move the threaded sleeve along and secure it to the rod, close the nut, and repeat the cutting as before until the entire length of a long screw has been gone over.

His explanation in the article of August 23, that he did not intend to cut any screws more than 16″ or 18″ in length, makes the matter clearly understood.

My criticism was confined entirely to the repeating process, as I understood the matter, and *not* upon the cutting of a single short length.

GEO. F. BALLOU.

Inertia.

Editor American Machinist:

Will you permit me to ask the author of "Inertia" (Aug. 23, 1884), what is his definition of "pound?" I ask this because he uses the word in two entirely different senses—*i. e.*, as a measure of *mass* and of *force*—in the following passages: "The force unit is such that if it act on one pound of matter one second will impart to it a velocity of one foot per second; and, "if the weight were 50 pounds, the force would be 500 pounds."

Heretofore the definition of force unit was:

"The *force* unit is such that if it act on one unit of *mass* one second, it will impart a velocity of one foot per second;" the unit of force being the weight of one pound, and the unit of mass being the mass of one pound-weight multiplied by the acceleratrix (32.16 feet, about).

In this connection, it may be stated, that we have neither a well-established unit of *force* nor of *mass*. The unit of force is the weight of the standard pound, but as the weight of this standard pound is not the same on all points of the surface of the earth, our standard of force is a variable one. The unit of mass is the mass of the standard pound multiplied by the acceleratrix, but the latter being different at different places, the unit of mass is not an established quantity, unless a standard acceleratrix (32.16 feet, or 9.808 meters) is adopted, no matter whether or not this is the actual acceleratrix at the particular place.

It would, perhaps, be more rational to adopt, as the author of "Inertia" does, the standard pound as the unit for *mass*, but this would require a reduction of the unit of *force* to about $\frac{1}{32}$ of the present unit, and such a change would be decidedly objectionable under present conditions.

Philadelphia, Pa. HUGO BILGRAM.

Waste of Fuel from Light Loads.

Editor American Machinist:

Few users of steam engines realize the enormous waste of fuel which is due solely to the purchase of engines which are much too large for the duty required. There is a tendency to consider that an engine is favored by a light load as regards wear. While this would seem to be an obvious fact, it is probable that it is true only to a very limited extent, as the absolute strains upon an automatic engine are due more to the initial than to the mean effective pressure. Still, conceding this point that the wear of an engine is lessened by a light load, and conversely hastened by an overload, the fact must be borne in mind that the saving is effected at the expense of an enormous and constant loss of fuel.

This matter has been so frequently ventilated in your columns, and is so well understood by engineers as to its theory and effects, that I do not purpose in this article to enter at all into a discussion of the causes of this loss, except to mention them by name. In short, then, the loss from underloading is due, comprehensively, to cylinder condensation, which, unlike leakage, is an insidious loss, always concealed, and by consequence very generally overlooked. A light load of course necessitates an early point of cut-off and extreme expansion of the steam. This is equivalent to saying the engine works with a high initial pressure and consequent temperature and a low terminal pressure and consequent temperature, since the temperature of steam is always in proportion to its pressure. There is, therefore, a fluctuation of temperature *twice* for each revolution between the extremes of the temperature of the boiler and the temperature of the exhaust. This fluctuation of temperature is necessarily communicated, to a greater or less extent, according to the speed of the engine, to the immediate surface of the interior of the cylinder, cylinder heads and piston. A high-speed engine will show less loss on this account than a slow-running engine, on account of the less time which these fluctuations of temperature have to act upon the metal of the cylinder. At the instant of exhaust the temperature of the steam and the cylinder surface will be in the neighborhood of 212°, and these surfaces will have to be heated up to the temperature of the incoming steam on the next stroke, or, say, to 300°, as an average. The heat to do this can only be obtained from the steam itself, at the expense of condensation and consequent loss of fuel, without corresponding work being performed. This is, briefly, an outline of the cause, although there is a cumulative effect whereby this loss increases, stroke by stroke, to a certain maximum. This last question it would be unprofitable to enter into at this point.

The whole object of alluding to this subject here is, not to elaborate the theory, but to illustrate it by an instance which has just been brought prominently to my notice. A certain party purchased an 80 horse-power engine on the supposition that they would then have a large surplus of power, with correspondingly good results. In point of fact, 25 horse-power would have been ample for their purpose, as was subsequently shown. The consumption of fuel with the 80 horse-power engine under a load of 25 actual horse-power was seen at once to be enormous, and the engine was freely criticised. The writer had occasion to investigate the case, and at once advised as to the source of the difficulty, and recommended the use of an engine proportioned to the work to be done. The parties in question being somewhat skeptical as to the results, a 25 horse-power engine of the same make was borrowed, and set up under the same load, supplied by the same boiler, and handled by the same engineer—the conditions, in fact, being precisely parallel. The result of the test was as follows: With the 80 horse-power engine and firing from a cold boiler, 1,900 lbs. of coal were burned in one day's run; with fire banked from the night before, 1,600 lbs.; with fire active, 1,300 lbs. With the 25 horse-power engine the same result was obtained on 750 lbs., being an average saving of fully 50 per cent.; and I have since heard that the same parties have reduced the consumption to about 600 lbs. This is an exceedingly practical illustration of what some people are disposed to scout as the fine-spun and useless theory of internal condensation. But so far as the writer's experience goes, there is nothing in the entire range of steam engineering which requires to be so carefully guarded against as a source of loss. As a final instruction, I would recommend in general that an automatic engine should be selected of such a size that its average duty should be performed between 35-pound and 40-pound mean effective pressure, corresponding to steam at 80 pounds, and a cut-off at from $\frac{1}{5}$ to $\frac{1}{4}$ stroke. Any cut-off less than $\frac{1}{6}$ stroke, or 30-pound mean effective pressure, will run very rapidly into extreme wastefulness. On the contrary, an overload beyond $\frac{1}{4}$ cut-off, or 40-pound mean effective pressure, will also produce waste, but in a far less degree than a correspondingly light

load. The only point to guard against is a load so excessive as to overtax the engine as to its capacity to maintain its speed, and to produce undue wear. ENGINEER.

The Lifting Force of Cores.

Editor American Machinist:

In the AMERICAN MACHINIST of August 2d, in Mr. West's paper on "Momentum and Weighting of Copes," he gives an illustration of and method for calculating the lifting force in a pipe mould. Taking the diagram as used in his paper, he computes the lifting force as equal to the weight of a mass of metal of the sectional area of the outline of Fig. 1, with the lift of the core equal to the semi-circle below the joint, and the lift of the cope equal to the rectangle above the joint. As the core, when completely surrounded by metal, is an immersed body, it must displace its own volume of liquid, and the floating or lifting force must consequently be equal to a mass of metal of the volume of the core.

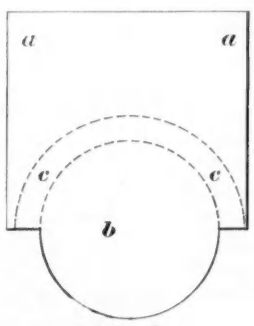


Fig. 1

The lifting force on the cope will be represented by the section *a a*, in Fig. 1, and the sum of both cope and core by the sum of *a a* and the circle *b*. The difference between this method and Mr. West's will be the space, *c c*, between the dotted lines, or half the weight of the pipe. R. MCKNIGHT.

Vallejo, Cal.

Uncertainty of the Indicator for Detecting Leaky Valves.

Editor American Machinist:

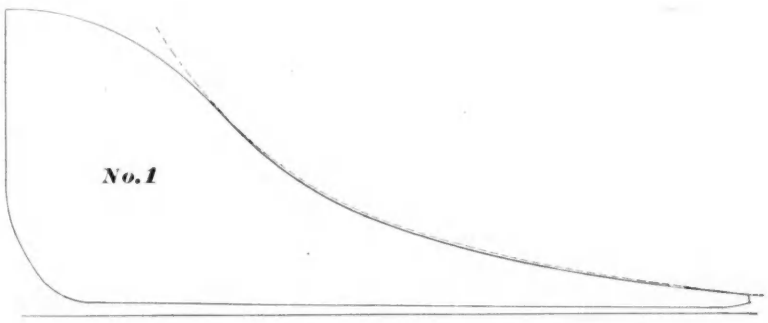
Mr. Hemenway's article in your issue of August 23, on the "Indicator Diagram," attributes to leakage the peculiar form of the expansion lines of the diagrams illustrated. The idea is also advanced that if the theoretical curve could have been located, as might have been done had the clearance of the engine been known, more satisfactory statements might have been made as to whether leakage occurred in the steam valves or in the exhaust valves.

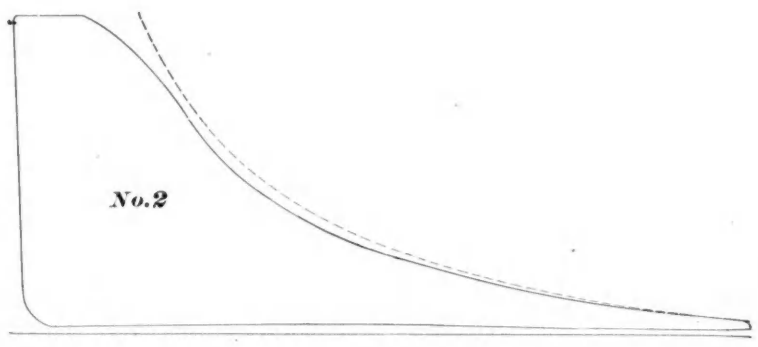
I have taken diagrams from many leaking engines while engaged in making feed-water tests of the same, and in some cases I have taken them after the leaks had been stopped. In some the expansion line, by departing from the theoretical, pointed to leakage, and corroborated the direct evidence obtained by testing the valves and piston for the purpose under steam pressure, but in many cases leakage produced no marked effect whatever on the form of the diagram. Instances of leaking engines have come to my notice so often in which the evidence of leakage given by the diagram was entirely wanting, or altogether uncertain, that I have come to the settled conviction that it is useless to study the indicator diagram for positive information on this subject. It is extremely liable to convey either mistaken notions or none at all.

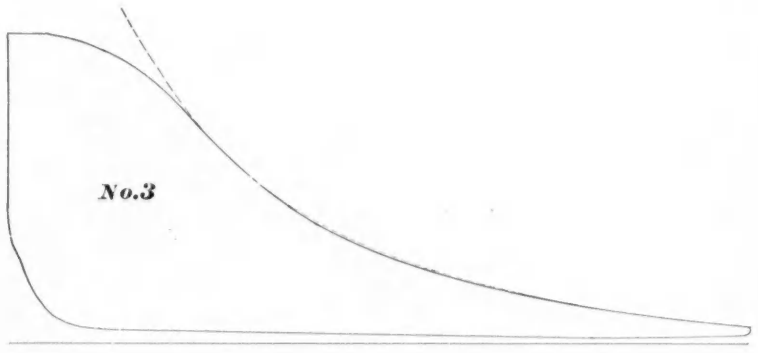
In this connection I would refer to the accompanying diagrams (the readiest at my command), which show, in some degree, the importance of these remarks. On each diagram a hyperbolic curve is drawn through the terminal point of the expansion line. Nos. 1 and 2 were taken from an engine in which the exhaust valves leaked. The steam valves and piston were tight. Nos. 3 and 4 were taken from the same engine after repairs had been made that wholly stopped the leakage. No other changes were made. A feed-water test, with the engine in the first condition, showed that it used 32.6 lbs. of steam per one horse-power per hour, of which 69 per cent. was accounted for by the indicator. When in the second condition the consumption of steam was 29.3 lbs. per horse-power per hour, of which 74 per cent. was accounted for by the indicator. Although the leakage, as these tests showed, amounted to 10 per cent., it will be seen that there is barely a perceptible difference in the shape of the diagrams, whether the exhaust valves leaked or not. GEO. H. BARRUS.

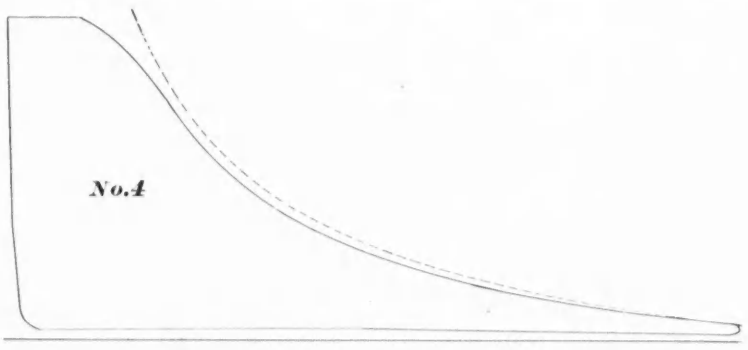
Boston, Mass.

[The above seems to convey the impression that I have advanced the argument that the indicator could in all cases be relied upon to detect leaky valves and pistons. Exactly what I did write upon this is (AMERICAN MACHINIST, March 1) amplifying something I had previously written: "It has been previously intimated that it was generally a difficult matter to determine how much of the variation of the actual from the theoretical curve was due to condensation and re-evaporation, and how much to leakage by valves and piston," and so on in a similar strain, referring to cut for illustration. But because it is *generally* difficult—impossible—to detect leaks by the use of the indicator, it does not follow that it is always so. In the diagrams referred to by Mr. Barrus (AMERICAN MACHINIST, August 23), it is apparent, without spending a minute in drawing curves—at least to any one acquainted with the type of engine—that in the diagram from one end of the cylinder the terminal pressure is several pounds higher than it should be, and that in the diagram from the other end it is too low. When this is so, I have *always*, under any supposable conditions, found it safe to rely upon the evidence of the indicator as to leaks somewhere. If Mr. Barrus will again read the article to which he refers, I am sure he will be willing to modify his statement that "the idea is also advanced that if the theoretical curve could have been located * * * statisfactory statements might have been made as to whether leakage occurred in the steam valves or in the exhaust valves." The only point upon which I predicated leakage was in the *very wide* difference in the expansion curves of the diagrams from the two ends of the cylinder.—F. F. H.]









The Buchanan Locomotive.

Mr. Buchanan, superintendent of motive-power and machinery of the New York Central Railroad, has recently had a locomotive built for passenger service at the shops at East Albany, which has all the latest improvements that the designer considers requisite for making an engine do its work economically. This engine, No. 238, of class A, has been put to service, and is doing remarkably good work. The cylinders are 17x24 inches; drivers, 68 inches diameter; and the boiler provides a heating surface of 1,354 square feet. The fire-box is made of the usual Buchanan type, with a water table running diagonally from below the bottom row of flues to the top of the back sheet. A coil of piping passes round the water table, wherein the steam that operates the air jets used in consuming smoke and promoting combustion is superheated. A single exhaust nozzle, four inches diameter, is used in this engine in combination with the extended smoke-box and the open stack. The combination promises to be very successful. The main frames of the engine are 2x6 inches—a style which gives a slightly wider fire-box than the square bar. In this case the frames are stiffened laterally by rigid braces. The engine truck and tender wheels are wrought iron of an English pattern, not unlike the Miltimore wheel.

A Venezuela Railway.

Railroad works, that lead the locomotive over mountain passes whose ascent used to be considered seriously hazardous to the sure-footed mule, have now become so common that a road of this character that has recently been opened in Venezuela attracts scarcely any attention, although but a few decades ago it would have been cited as a great triumph of engineering skill. This railway, 23.6 miles in length, is of 3-feet gauge, laid with steel rails weighing 50 pounds to the yard, and with cross ties of vera, a wood similar to lignum vitæ. It has a maximum grade of 3½ per cent., which is continuous from La Guayra to a point 17 miles distant, with the exception of three short horizontal sections at water stations. It has a minimum curve of 140 feet radius. Indeed, the entire road is a succession of curves and reverse curves, through colossal excavations and over stupendous precipices. The total excavation to grade the road-bed amounts to 1,650,000 cubic yards, or nearly 40 cubic yards of excavation to each linear yard, two-thirds of which is through rock, and of which a great part was removed by dynamite. There are three viaducts and eight tunnels in the line of the railway, four of the latter being excavated through solid stone, from one of which the track debouches upon a rocky shelf at a sheer perpendicular of 1,600 feet upon the gorge of Boqueron. The cost of this railway, equipped with six locomotives, fifteen passenger and sixty freight cars, amounts to the sum of $2,000,000, nearly all of which has been contributed by English capitalists. It has been built under the supervision of Gen. William A. Pile, formerly Minister of the United States to Venezuela. From an industrial point of view, the completion of this road is the inception of a new era in the history of Venezuela. The people, accustomed to the primitive methods of transportation, are now awakened to the fact that the old system of pack mules and dump carts must be abandoned, and that the vast riches of the interior must have these iron avenues for their convenient and expeditious transportation to the seaboard. And once that a railway southward from Caracas has pierced the mountain ranges that border the northern boundaries of Venezuela, beautiful valleys and broad plains, watered by the Orinoco and its tributaries, and teeming with exhaustless agricultural wealth, will pour their treasures into the lap of commerce.

Mr. J. S. Porter, master mechanic of the Indiana, Bloomington & Western Railway, tried to prevent the flues and fire-boxes of his locomotives from getting coated with lime scale by painting them with a petroleum paint. The paint did not keep the scale from adhering to any part of the heating surfaces, but it made the removal of the scale an easy matter, since a tap with a hammer was sufficient to clean a flue that, without the paint, would have required hard rattling for two or three hours before the crust of lime would have broken off.

Lettering Patterns.

We noticed recently, at the machine shop of James Brady, in Brooklyn, some wooden patterns with letters put on to stay, which is more than can generally be said of pattern letters. The letters were on a metal plate—more properly, they were a part of a metal plate—the latter let into the wood and screwed fast. At first thought it seemed to involve a good deal of expense, but upon inquiry it was found to be one of those jobs that are a little easier done right than wrong. The manner of making these letter plates is simply this: A piece of sheet brass, thick enough to hold its shape, is cut to the desired dimensions, and on this ordinary pattern letters are arranged as desired, and held in place with shellac. This is the pattern or "form," which is sent to the electrotypers, and from which an electrotype, backed up with any desired thickness of soft metal, is made. This electrotype can be let into the pattern, leaving the surface of the plate flush and the letters "raised," or, if it is desired to

have the casting with a raised spot for the letters, it can be put on the outside, leaving the thickness of the copper deposit and the backing above the general surface. In either case, there is every probability that the letters will be found in place as long as the pattern lasts. The plate can, of course, be readily bent to suit any curvature of pattern. We suppose a similar process is sometimes employed in making name plates, but this is the first instance we have known it employed for lettering patterns.

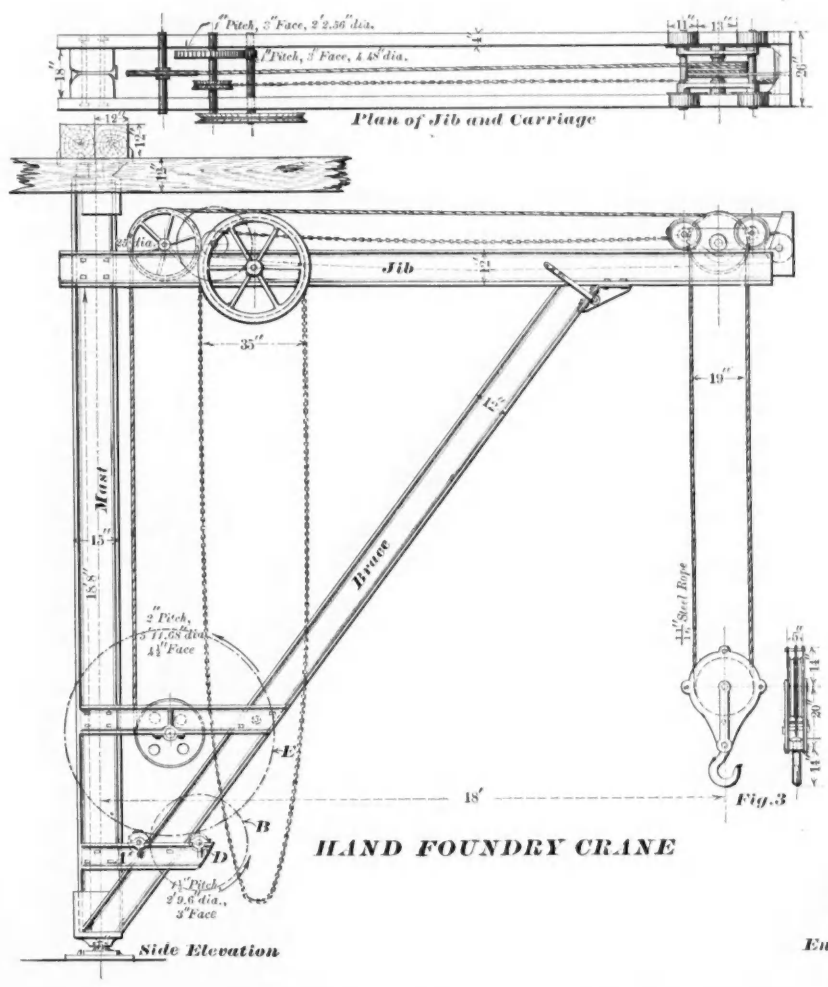
Foundry Cranes.

BY THOMAS D. WEST.

THIRD PAPER.

Although power cranes have many advantages over hand cranes, the simple mechanism of the latter is alone a factor which will always command attention. The simplicity of hand cranes is such as to allow their being made by almost any firm, whereas the power crane will often require to be built outside.

A few years since the frames of cranes were almost entirely made of wood, but at the present time many are made entirely of iron, the low price of iron making this construction about as cheap as when made of wood. Iron is really the proper material. Iron cranes not only look neat and light, but they are durable, and will keep their original shape. Wooden cranes, through unequal shrinkage, get more or less out of shape, thereby often causing trouble with carriages, gears and chains.



HAND FOUNDRY CRANE

The iron hand crane of Messrs. Webster, Camp & Lane, Akron, Ohio, which I am enabled to here show, is very simple in construction and readily worked. The end elevation shows the crane as one would see it if viewed from the front. The gears are shown engaged for "fast motion." To engage for "slow motion," the pinion *A* is pushed into contact with the gear *B*. The cranks, or handles, are removable, so that for either speeds two handles may be used.

Some cranes are so arranged that the handles always remain upon the one shaft. In such cases they are generally secured by means of a nut or pin upon end of, or through, the shaft. Where handles are not thus secured they should, as shown at *F*, have plenty of shaft length. In this, as well as other features of the crane, the experience of practical men is seen. Some may think this shaft question one of minor importance. I know it's a simple thing, and one to which, by many designers, no attention is paid. A handle that requires to be changed from one shaft to another necessarily requires a very easy fit. Where the square part of shaft is so short, as with many cranes, the handles can readily work off without its being noticed. There are many besides the writer who could testify to this often having occurred, and to serious accidents caused thereby that would have been avoided had there been more length of handle shaft. The increased length not only gives a better chance to notice any working off of handles, but also provides more room to guard against errors upon the part of thoughtless foundry helpers.

The principle involved in the plan of carriage here shown is one which the reader will remember was previously favorably commented pon, a point which much simplifies the cranes frame construction is having but one girder for the mast.

One of the most modern features of this crane is the use of wire rope for the sustaining cord. Wire rope would, no doubt, in years to come be the most popular sustaining cord used were it not because its durability demands much larger drums and sheaves than the chain or hemp rope.

John A. Roebling & Sons, manufacturers of wire ropes, and who are taken as authority upon strength of wire ropes, in one of their tables, call for the drum and sheaves in crane shown for steel wire ropes to be over three feet in diameter. I think it can be shown that the use of such large drums and sheaves as Roebling's table calls for is not very practicable in foundry crane construction.

The Roebling table certainly gives sizes which, if used, will increase the length of time a rope will last, compared with the use of smaller sizes, but what many would like is a table that would tell them how small drums or sheaves could be used without serious injury. In our foundry we use a ½" iron wire rope (hemp center), on the core-maker crane, the drum of which is 7½" diameter. Roebling's table calls for a drum for this sized rope to be 18" diameter. The rope coils around the drum very readily, and, although in use some time, there is no apparent injury done to it yet. Before putting this rope upon the crane it was passed over a charcoal fire, and heated about as hot as the hand could bear. While hot it was soaked in a pan of oil; then, after being put up, the rope was kept well coated with a mixture of oil and black lead. Throughout the works there are several wire rope cranes, and all of the ropes are kept well coated with oil and lead. There is no question but that wire ropes are much benefitted by being kept well lubricated, and that when so attended to small drums or sheaves may with much success be used.

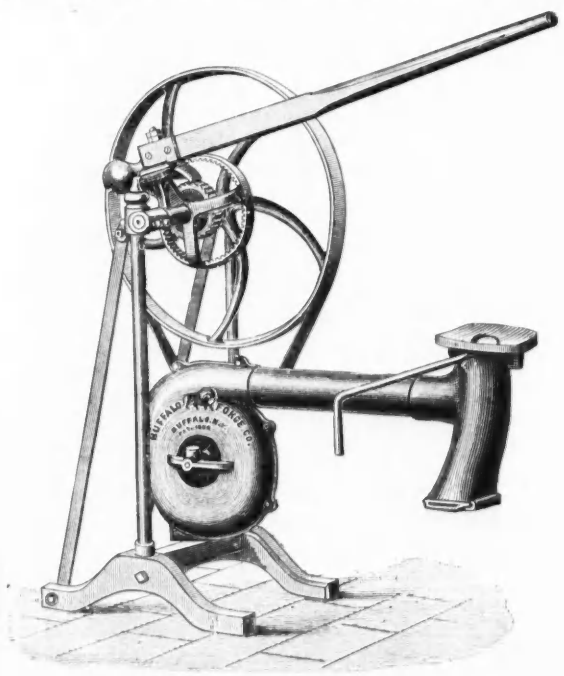
For the area there is nothing to equal the strength of a steel rope. In the case of the crane shown, the rope, by Roebling's table, would only have a safe lifting capacity of about five tons. To break the rope a load of about twenty tons would be required; therefore, a load of fifteen tons could be occasionally hoisted without breaking the rope.

In using wire ropes for foundry cranes, the lower blocks should be made heavy enough to hold the rope straight and pull themselves down. This evil overcome, the wire rope makes an excellent sustaining cord, and has points which recommend its use instead of chains or hemp ropes. The use of chains often cause more or less jerking, and they are treacherous, as they break without giving any warning.

Hemp ropes are objectionable on account of their short life and their clumsiness. If daily used, they are not worth much at the end of a year. The heat and dampness of a foundry soon destroy them.

Wire ropes will hoist steadily, are neat and light, and will often give warning before they break. About the only objection to their use is, their requiring such large drums and sheaves to insure their longevity.

COMBINED PUNCH SHEAR AND BAR CUTTER.



BLACKSMITHS' HAND BLOWER.

Blacksmiths' Hand Blower; Combined Punch, Shear and Bar Cutter.

These are new machines brought out by the Buffalo Forge Company, Buffalo, N. Y. The blower, as will be seen by reference to engraving, is arranged on an upright frame of iron, and is operated by means of a natural swivel motion. By a downward motion of the hand lever the pawls are engaged with the ratchet wheel. The small pinion, on being thrown forward, is revolved on its axis by means of the large fixed internal gear, and in turn communicates motion to the large band or fly-wheel, which by means of a belt drives the fan.

The entire mechanism is operated on a single fixed steel shaft, which it is claimed reduces the friction, while the combination of gearing avoids slipping, affording at all times a positive motion.

All parts are made interchangeable, and require no fitting in being adjusted to place.

The combined punch, shear and bar cutter, is made in three sizes. The small size will shear $\frac{1}{4}'' \times 2\frac{1}{2}''$ iron, will cut $\frac{1}{2}$ round or square iron and punch $\frac{1}{4}''$ holes in $\frac{5}{16}''$ iron $3\frac{1}{2}''$ from edge.

The medium size will shear $\frac{3}{8}'' \times 3''$ iron, will cut $\frac{5}{8}''$ round or square iron and punch $\frac{5}{16}''$ holes in $\frac{3}{8}''$ iron 5" from edge.

The larger size will shear $\frac{1}{2}'' \times 4''$ iron, will cut $\frac{7}{8}''$ round or square iron and punch $\frac{1}{2}''$ holes in $\frac{3}{8}''$ iron 6" from edge. Double the above widths of iron may be cut by reversing.

The power applied to cutting is said to be on a leverage of 125 to 1, and in a perpendicular direction, without lateral strain. There are but five pieces used in the construction, and these are made interchangeable.

The New Orleans *Times-Democrat* says:

The result from establishing a furniture factory in this city or other locality of the South promises most satisfactory returns, and with the wealth of timber at easy command, and the demand of this market, a concern with ample capital, and constructed on the advanced principles of the North and West, with their improved machinery, is almost sure to produce handsome profits. The hard woods of the South, are constantly being shipped to Northern, Eastern and Western markets, from whence, it is re-shipped, and we purchase our own original product at an expense which in a short time would yield fortunes,

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NEW YORK, SEPTEMBER 6, 1884.

CONTENTS.

	PAGE
A Rotary Steam Snow Shovel	1
Prospects of Young Engineers	2
Arresting Decay of Wood	2
A Long Train	2
Machine-Cut Swiss Pattern Files	2
A Happy Thought	3
The Waldron Rotary Engine	3
A New Explosion Danger	3
Boiler Construction. By George Marshall	3
How to Originate a Scale of Equal Parts. By F. G. Woodward	4
Letters from Practical Men—Proportioning Slide Valves and Determining the Effect of Different Proportions — Inertia — Waste of Fuel from Light Loads—The Lifting force of Cores—Uncertainty of the Indicator for Determining Leaky Valves	5, 6
The Buchanan Locomotive	6
A Venezuela Railway	6
Lettering Patterns	6
Foundry Cranes. By Thomas D. West	7
Blacksmith's Hand-Blower; Combined Punch, Shear, and Bar Cutter	7
Crop Influence on Machine Trade	8
Advantage of Having a Solid Foundation	8
Arrangement of Inventions at New Orleans Exposition	8
Prospects of Our Losing a Machinery Market	8
The Iniquitous "Drummer" Tax	8
Poor's Railroad Manual, for 1884	8
Literary Notes	9
Questions and Answers	9
Manufactures	9
Machinists' Supplies and Iron	10

Crop Influence on Machine Trade.

The transportation interests of this country are so stupendous that influences which depress them exert an injurious effect upon every other branch of industry, and mechanical interests are peculiarly liable to suffer from this cause. For several years back crops were a partial failure over nearly the whole country, and not an inconsiderable amount of the depression in railroad securities is due to the decreased earnings resulting from the loss of business that resulted from short crops. This season brings tidings from all quarters that the crops are very bountiful, and the effect cannot fail to exert improvement on all lines of business. The wheat crops are safely harvested, and insure abundance of that staple; in the corn raising districts the corn crop is most encouraging, and a heavy yield will revive many depressed industries. In the early part of the season grave fears were entertained of Southern crops, but they have proved groundless. Sugar cane is now reported as looking unusually well; rice is already assured to be a good crop, and cotton promises a gratifying yield. In this regard it is a wonderful fact that a great stretch of country bordering on the Mississippi River which was under water sixty days ago, is now blooming with cotton, rice, and sugar cane. The revival of trade that will bring spare locomotives out of round-houses on the road, and will put the numerous idle cars in motion, will encourage railroad companies to buy a little more than is demanded for their immediate needs, and idle tools will in consequence be set to work.

Advantage of Having a Solid Foundation.

Most of us have, doubtless, at some time in our lives felt dissatisfied with our position and attainments to the extent of wishing that our lives might be based upon some foundation less imperious than the hard rule of necessity.

But who of us would care to do specially dirty or disagreeable work, for example, unless obliged to do so by the force of circumstances? And what would become of human progress if no one were forced to do his share of such work? And we must not forget that such work is even more necessary than any other. That some, unhappily, have to do *more* than their share, is an inequality that exists, because it needs correcting.

If the requirements of hard necessity could be superseded by the demands of sentiment or caprice, even for a single year, what a muddle this world would get into, to be sure! In that case nobody would feel like qualifying himself by determined endeavor or hard study for a higher place, because there would be no sort of assurance that such qualifications would count for anything in such a struggle. Luck or fancy would be quite as likely to carry off all the prizes.

Nobody would feel encouraged to toil laboriously in building up business. As things now stand, everybody who manufactures or sells anything, does so to meet a distinct need on the part of his customers. People buy clothing to keep them warm or keep them decent, and however poorly they can afford to pay out money for this purpose, stern necessity forces them to do so. The man who manufactures clothing builds upon this necessity, and certainly could not afford to build upon any basis less absolute.

The man who invents a machine or process could not afford to spend time and money and labor and privation upon it, unless assured that his business, so created, was based upon solid necessity. Few men who have a trade or a business to depend upon, would be able to look forward to the coming years with much confidence unless well assured that each year would bring its round of hard necessities for others as well as themselves. With these as a foundation to build upon, labor and merit are sure of at least some share of reward.

The Nickel Plate Coal Mine, at Brazil, Ind., must be a cheerful place. It is stated that the miners employed there are working only about half time, while the same report says the company have put up a notice at their shaft that all men employed there must trade at the company's store. We suppose this latter arrangement is intended to operate somewhat on the "heads I win, tails you lose" plan. The men get half pay at the mine, and surrender it at the store.

Arrangement of Inventions at New Orleans Exposition.

Hon. Benj. Butterworth, for the Board of Managers appointed by the President to take charge of the government exhibit to be made at the New Orleans Exposition, has sent out a circular requesting aid in carrying out what will be a most interesting method of exhibit. He wishes to arrange certain exhibits in such a form that they will graphically represent the work of inventors during its various stages, taking the first crude contrivance and illustrating it by model, drawing, or picture. This will be followed by a representation of every progressive step made until the most perfect machine or device is presented. To illustrate: He will show the first crude contrivance used for printing, and by aid of models and drawings trace the art of printing through its progressive stages of development up to the present complex perfected printing press. The field being very wide, he must confine himself to a limited range of inventions, but those that are most conspicuously before the public, and those that are likely to excite greatest interest, will be selected.

It is Mr. Butterworth's purpose to show the effect these several improvements have had upon the industrial classes of this country, and to prove conclusively, by statistics shown in connection with the devices exhibited, that instead of depriving men of employment, the utilization of the various products of inventive genius has increased the opportunities for labor, and enhanced wages, thus securing better homes and home comforts for all our people.

As the appropriation made by Congress would be inadequate to cover the expenses in carrying out this plan, manufacturers of machinery which will show the development of any particular art are requested to furnish models and information bearing thereon. Illustrated catalogues, sketches, cuts, and engravings, old and new, are also asked for as an aid to the artists engaged on the work. In this connection many of the models now stored in the Patent Office will be used to illustrate invention and development of the machinery on which they can throw light.

In connection with this exhibit it is the intention of Mr. Butterworth to prepare statistics, which will be of great value as a book of reference, showing as they will the influence of the product of invention on the growth of the industries of this country, and in fact of the world, the results accomplished, and the advantages gained to the industrial classes specially and to the world generally. His position as Commissioner of Patents at Washington gives Mr. Butterworth an excellent opportunity to make a work of this kind successful.

Prospects of our Losing a Machinery Market.

There are indications that Cuba is about to escape from the imbecile grasp of Spain, and reports say that the fortunes of this naturally rich island are likely to be controlled by Germany. For some years back American machine shops have found an increasing market for different lines of machinery in Cuba, even with the terribly depressed condition of trade due to scandalous misrule. There seemed to be a probability that political changes, which would provide enlightened government for the island, and thereby bring a return of prosperity to the people, would result in giving us still a better market; but, if Germany succeeds in obtaining control of Cuba, we may bid farewell to that as a trading point. The animus of Germany's rulers, that prohibits the admission of the American hog to Germany, will prohibit American sugar machinery from going into Cuba. Germany is the leader in Europe of the policy of protecting native industries—a policy which is certainly exercising a beneficial effect upon the prosperity of Germany's own population. This country should be the last to find fault with Germany's protective creed, but it is a different matter when the prospect appears of what is naturally an American dependency, as Cuba, is being governed in the interests of German industries, and against those of America. It seems that the policy which was exercised against France ruling Mexico should be exerted against Germany taking possession of Cuba. If some of our idle steel works had been busy for the last year turning out material for building a modern navy, and our machine shops working on machinery for an efficient navy's equipment, we would be in a better position to say whether or not the Monroe doctrine has become a dead letter.

The Iniquitous "Drummer" Tax.

The city of Washington, the capital of the nation, owing all its advantages and, in fact, its very existence to the nation, is now about the only place in the nation of any size or pretensions, where the citizens of the nation have no rights, if they have the misfortune to represent industrial or commercial interests on a legitimate business errand. The city still seeks to levy the outrageous tax of $200 a year upon "drummers," as they call them, though we have never heard of any effort on their part to keep out lobbyists, bogus claim agents, or political dead beats. This is an iniquity which should be speedily done away with, not only in the interest of fairness to the whole nation, but in the interest, as well, of the great majority of the capital city's own people.

Poor's Railroad Manual for 1884.

We have received *Poor's Manual of Railroads*, for 1884, and find this, the seventeenth annual issue of this ponderous publication, from such examination of its contents as we have been able to give it, not only an important work in itself, but an advance upon the previous issues. Especially we note greater clearness and completeness in many of the descriptions and tables.

An always useful feature in this work is the introduction and review of the railroad progress of the year to which the book refers. The present sketch shows for the United States, a railroad mileage at the close of 1883, of 121,592 miles, of which 6,753 miles were constructed during the year, the average mileage operated during the year being 110,414 miles. Referring to the increase in share capital, and funded and floating debt, the review calls attention to the fact, that, although, since 1879, the actual cost of construction per mile has steadily diminished, very few expensive lines having been built, and the cost of all construction material being unusually low during the last half of that period, the apparent cost, as represented by share capital and debt, has steadily increased, this increase for the four years since 1879 equaling the large sum of $4,446 per mile.

Whatever defects may still be found to exist in this publication, it should be said, that few persons have an adequate idea of the amount of work involved in the preparation of a work of this character, containing, as it does over 1,000 pages of information, much of it doubtless wrung from unwilling railroad managers, scattered over every part of the North American continent. In estimating rightly the results of their labor due credit should be given to Messrs. Poor for this limitation. Probably the real and whole truth regarding many railroad corporations will never appear in "manual" form, until a properly constituted Government commission shall be appointed under a wisely drawn general law, not to fix rates or run the railroads, but to let daylight into their affairs through possession of legal authority to demand information and report upon abuses. This authority, when granted, will doubtless necessarily be confined in its operation to "inter-State" railroads and corporations, but meanwhile there is oppor-

tunity for the various States to appoint State Commissions, for the supervision of local railroads. The unquestionably good record which the New York State Board of Railroad Commissioners is making in its effort to be fair alike to the people and to the corporations concerned, will doubtless lead to the establishment of similar bodies in other States.

Meanwhile, the public are under obligation to the publishers of *Poor's Manual* for collecting a mass of information and statistics, whose value to the community can hardly be overestimated.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(339) C. S., Cincinnati, O., asks: Define lap and lead of slide valve? *A.*—For explanation, and illustration, see AMERICAN MACHINIST of February 9 and 23, 1884. We cannot discuss the comparative merits of rival devices in this column.

(340) B. L., Durham, N. C., asks: What is used in the manufacture of sash weights, whereby they can be sold for one cent a pound? *A.*—We know of no secret, except the use of the cheapest grades of iron. We think there must be some mistake about the price.

(341) S. C. G., Hingham, Mass., asks: What should be the proportion of ports, valves, and bridges, travel of valve, lap, etc., for an engine 5″x6″ to run 300 revolutions, and cut off at ¾ and at 5-6 stroke? *A.*—A very good proportion would be: Steam ports 7-16″x4½″, exhaust port ⅞″x4½″, bridges ½″. To find the lap, travel, etc., for cutting off at any desired point, study the articles by Prof. Sweet, now appearing in the AMERICAN MACHINIST.

(342) C. S., Riverside, N. J., asks: 1. Is it injurious to a boiler to burn leather chips in the furnace? *A.*—We do not think it injurious. 2. Where can I get a good check valve? *A.*—From any responsible dealer in such goods. The reason why there are so many poor ones sold is because buyers look for the cheapest. 3. Would it be advisable to use two check valves instead of one? *A.*—One good one, with a stop valve close to the boiler, is sufficient.

(343) S. & Co., Atlanta, Ga., writes: We have a new 14-horse power boiler, covered with non-conducting material; the steam pipe to engine, which is 10 feet from boiler, is also covered. The engine is a highly-finished product of one of the best makers, plain slide valve, cylinder 6″x9″. What power will we get under the following conditions: 1. Boiler pressure 50 lbs., 130 revolutions of engine. 2. 60 lbs. pressure, 150 revolutions. 3. 70 lbs. pressure, 180 revolutions. 4. 80 lbs. pressure, 200 revolutions? *A.*—Indicated power under conditions named, about 4½, 6, 8, and 10-horse power, respectively.

(344) S. M., St. Louis, Mo., asks: 1. Suppose I want to construct a diagram, as in Fig. 1, in which the line *a b* represents vacuum, line *c d* atmospheric pressure, *c e* pressure above atmosphere =60 lbs., and *a e h g* the clearance. On *g h* construct the square *g h i k* and draw the diagonal *g i*. Is not *g i* the axis of a parabola? If so, we know that *d* must be a point in the curve, and how shall I now proceed to find other points? What I refer to is a diagram from the air cylinder of an air compressor. *A.*—We suppose you mean the hyperbola, which is the curve to which indicator diagrams are commonly referred. The diagonal is the axis of this curve. In Fig. 2 is represented the plan to which you probably refer for finding points in this curve. The upper horizontal line represents the greatest pressure (60 lbs.); other lines, same as in Fig. 1. As you start from atmospheric pressure, first draw the diagonal from the point where the vacuum line meets the clearance line to the point where the vertical line *d* meets the line of greatest pressure. From the point where this diagonal cuts the atmospheric line (because you start from atmosphere), draw the vertical line *p*, to *f*, which will be the end of the curve. This gives you two points, *d*, *f*, in the curve, the beginning and end, respectively. To establish another point, from any point, *n*, on the upper line, draw the line *o*, and from the intersection of this line with the line *p* draw the horizontal line *r*, and from *n* the vertical line *s*. Where these lines meet, at *h*, will be another point in the curve. In this way any desired number of points can be established, drawing all horizontal lines, corresponding to *r*, from the intersection of the diagonal lines and line *p*. 2. If air is compressed, will not the volume be increased with the increase of temperature, and will not the compression curve rise more rapidly, as indicated by the dotted curve in Fig. 1? If this is so, how shall I determine the curve? *A.*—The pressure will rise more rapidly than represented by the hyperbola, how much more so depending partly upon how much heat escapes through the cylinder, or how much the air is artificially cooled during compression. We cannot give you any reliable plan for constructing a diagram that will accurately represent the compression curve. If you properly cool the air the curve will probably rise from 10 to 15 per cent. quicker than would be indicated by the curve of the hyperbola. 3. Suppose the average resistance in the air cylinder to be 40 lbs. per square inch, would a steam cylinder of sufficient area to give same average [total] pressure plus about 30 per cent., using a fly-wheel of suitable weight, overcome the resistance? For example: Let *p* represent average steam pressure, *r*=average resistance in air cylinder, *D*=diameter of air cylinder, D_1=diameter of steam cylinder, *S*=stroke of steam piston, S_1=stroke of air cylinder, and $S=S_1$. Then with an air cylinder 15″x18″ (average resistance=40 lbs.) and with boiler pressure 60 lbs., would the area of steam cylinder be:

$$p\left(D^2\frac{\pi}{4}\right)S = r\left(D^2\frac{\pi}{4}\right)S_1 + \left(S_1 r D^2\frac{\pi}{4}\right)30\%$$

That is $p\left(D^2\frac{\pi}{4}\right)S = \left(40\times176\right) + \left(40\times176\right)30\%$

That is $p\left(D^2\frac{\pi}{4}\right) = 6040 + 1812 = 7852$

Therefore $\left(D^2\frac{\pi}{4}\right) = \frac{7852}{p} = \frac{7852}{60} = 117.5$

square inches area of steam cylinder, equal to about 12½″ diameter? This does not seem to me to be right. I should use a steam cylinder about 15″ diameter. *A.*—The deductions from your formula are incorrect, as you will readily see if you will look them over carefully. You start out by concluding to make a steam cylinder of such area (the stroke being equal to stroke of air piston) that the area of steam cylinder multiplied by boiler pressure shall equal area of air cylinder multiplied by resistance, plus thirty per cent. But 117.5×60=7050 and 176×40 =7040, substantially equal. Besides, *p* should= mean effective pressure in steam cylinder instead of boiler pressure, the former never being equal to the latter. The 30 per cent. ought to cover friction, which we suppose is what you intended. We should come at the size of steam cylinder something like this: Area of air cylinder multiplied by resistance, 176.7×40=7068, 7068+30 per cent.=9188, 9188+60 (the effective pressure in steam cylinder)=153, the area of steam cylinder. This area corresponds to a diameter of about 14″. If the boiler pressure was 60 lbs., we should, in place of 60, use some number less than that, determined by a consideration of the construction of the steam cylinder. If steam is worked substantially full stroke, with well-proportioned valve motion, you could use the number 50,

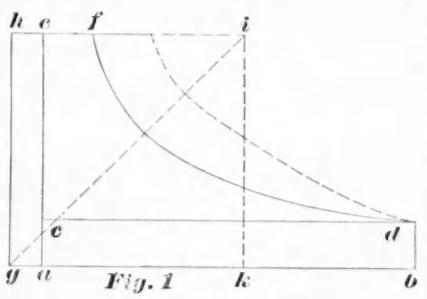

Fig. 1

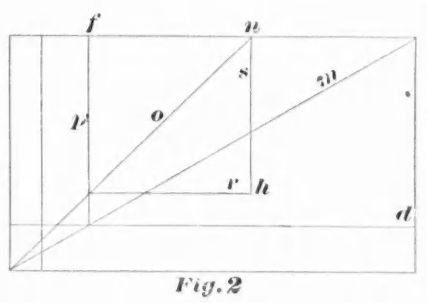

Fig. 2

which would make the steam cylinder a little more than 15″ diameter. 4. What weight fly-wheel, of say 3½ feet diameter, will be sufficient to help piston from point *f*, Fig. 1, to end of stroke? *A.*—it will depend upon the speed at which you run. Fly-wheel of about the same dimensions as for an ordinary steam engine will answer. A fly-wheel only 3½ ft. diameter would be awkwardly small in diameter to get the required weight.

BUSINESS SPECIALS

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis pressure regulator and st'm trap. Aug.23, p.14.

Mackenzie Cupolas and Blowers. 245 Broadway, N.Y

Presses & Dies, Ferracute Mach.Co., Bridgeton, N. J.

Steel Name Stamps, &c J. B. Roney, Lynn, Mass.

Rotary Files, Tower M.Works, E. Brookfield, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Crists' high-speed compound engines. Crist Engine Works, 182 Centre st., N. Y. Send for circular.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

National and box chucks, foot and power lathes, and slide rests. Lodge, Barker & Co., Cincinnati, O.

Split Pulleys at low prices, and of same strength and Appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

DRAWINGS—Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N.Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham St., N. Y.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Steam users, expecting to put in a first-class engine, from 10 to 60-horse power, will find it to their interest to send to the Straight-Line Engine Company, Syracuse, N. Y., for their new catalogue.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

MANUFACTURES.

The town of Canastota, N. Y., is surveying for water works.

V. L. Wilson is building a new four-story mill at Lowell, Mass.

A new company is talked of, to establish a smelter at El Paso, Texas.

The Meriden (Conn.) Bronze Company are erecting a new brass foundry.

Paterson, N.J., silk manufacturers report more inquiries and better trade prospects.

The Cowles Hardware Company are erecting extensive factory buildings at Bridgeport, Conn.

The emery-wheel factory of the Tanite Company, Stroudsburg, Pa., is to be materially enlarged.

The following Dakota towns want flouring mills: Hillsboro, Castlewood, La Moure, Steele, and Groton.

William Aiken and T. H. Lighton are to erect a large foundry and machine shop at Birmingham, Ala.

Detrick & Harvey, machine tool manufacturers, Baltimore, Md., contemplate building a new shop shortly.

M. C. Chambers is erecting a four-story brick factory building, 50x60 feet, on Whipple street, near Throop avenue, Brooklyn, N. Y.,

The Tunis Gang Flooring Machine Company is the name of a new corporation organized in Baltimore, Md, to manufacture gang flooring machines and place them out on royalty.

The International Mining, Smelting, and Manufacturing Company, of Minneapolis, Minn., it is stated, is to build extensive iron works at East Selkirk, near Winnipeg, Manitoba.

T. H. Ricker & Sons, Harrison, Me., have just shipped one of their sawing machines, for sawing staves and spool stock, to Gottenburg, Sweden. They are also expecting orders from Australia.

The United States Forcible Car-Brake Company, organized under Illinois laws, proposes to locate at South Chicago. A manufactory and general offices will be erected as soon as possible.—*Age of Steel.*

The Oneida Steam Engine and Foundry Company, Oneida, N. Y., write us: Our trade has been very fair so far this year. We shall make an exhibit in the St. Louis Exposition, where we have obtained a good location.

We have received a catalogue of the Portland Iron Works, Portland, Pa., containing illustrations of steam engines for various purposes, pulleys, sheaves, gearing, couplings, hangers, boxes, mill spindles, etc, etc. The catalogue is very convenient for reference.

A projected railroad, known as the Columbus, Fort Wayne, and Western, is to connect the Chesapeake and Ohio system with Lake Michigan. McConnellsville, O., and Benton Harbor, on the shore of Lake Michigan, are its termini. Work has commenced at the McConnellsville end.

E. O. & E. W. Thompson, Thomasville, Ga., is the name of a new firm of dealers in machinery of all kinds. The senior partner is a retired saw-mill man well acquainted with saw-mill machinery. The junior is a graduate of the mechanical department of Cornell University, and for some years past in the cotton-seed oil business, at Thomasville.

The *Age of Steel* says: The Expanded Metal Company, was incorporated in this city [St. Louis] on Tuesday last, with a capital stock of $100,000. The incorporators are: John F. Golding and J. S. Salisbury, of Chicago; Oscar Bradford and Henry S. Turner, of St. Louis. The purpose of the company is the manufacture of a new class of metal wares.

The firm of Lowe & Watson, of the Bridgeport (Conn.) Boiler Works, has been dissolved by mutual consent, William Lowe continuing the business under his own name. Mr. Lowe states that he has recently patented valuable improvements in boiler furnaces, and has improvements in boiler fronts, which place the manipulation of oxydizing the gases of the fuel entirely in the hands of the attendant.

The *Cleveland* (O.) *Iron Trade Review* publishes two items of Ohio news, as follows: The American Pneumatic Company, of Chicago, has decided to purchase the Nes Silicon works, in Sandusky, O., and convert the establishment into a mill for the manufacture of bar, round, square, and flat iron. F. W. Parsons has lately started the manufacture of an improved vise, on Superior street, Cleveland and Pittsburgh Crossing, Cleveland. A company is forming to push it.

A. B. Stetson, a mechanical engineer of long experience in building and operating excavating and hoisting machinery, has opened an office at 47 Main street, Lockport, N. Y., for the purpose of furnishing estimates, plans, specifications, and prices, on dredges, steam shovels, hoisting derricks, pile drivers, ditching machines, steam tugs, wrecking pumps, dump scows, etc., etc. Mr. Stetson was superintendent of the Pound Manufacturing Company for ten years.

The Westinghouse Machine Company have just built for the furnace of J. E. Thropp & Co., of Edge Hill, Pa., a portable outfit for crushing ore and slag. It consists of a flat car, on one end of which is mounted a Westinghouse water-tube boiler, and on the other a Gates crusher, to which is coupled directly a 30-horse power Westinghouse engine, the coupling being made to serve as a breaking piece as well. A friction gear also connects the engine with one of the car axles, and the car is, therefore, self-propelling at will.

The Ballou Manufacturing Company, Hartford, Conn., write us: In your issue of August 23, we notice an answer to a correspondent giving the drill sizes for U. S. standard taps. In our new catalogue, which will be ready in about one week, we give both the theoretical and working depths of all threads, from 1 to 320 per inch, and from 1 to 320 per centimeter. The figures are given for the following four systems: Sellers, Whitworth, Sharp V (60°), and watch-screw (45°). By these tables the tapping size for any thread can be obtained in a moment's time.

The Leighton & Wilbur Automatic Knitting Company has been incorporated with a capital of $100,000. The company are successors of George A. Leighton, who remains in the business as general manager. The new concern is removing the machinery and tools from Manchester, N. H., to West Medway, Mass., where it has leased a large factory for the manufacture of knitting machinery. Vickers & Weston, Philadelphia, have erected a 30x65-feet building on Palmer street, one story high, to receive machinery for the manufacture of full-fashioned hosiery.—*Dry Goods Bulletin.*

The Tabor Manufacturing Company has recently been incorporated under the laws of the State of New York, to manufacture the Tabor steam engine governor. The company also purpose adding the manufacture of some other specialties. They have now in course of construction, at the factory in Brooklyn, one thousand governors. Harris Tabor, the inventor of the governor was, until recently, superintendent of the Westinghouse Machine Company, but has severed his connection with that company to engage in the new enterprise. The officers of the company are: Chas. A. Moore, president; E. L. Maxwell, vice-president; H. S. Manning, secretary and treasurer; Harris Tabor, superintendent. Office and salesroom of the company, 111 Liberty street, New York.

In the belt factory of Lawrence & Herkner we lately examined some very large belts in the course of construction. One belt is 50 inches wide and 107 feet long, while there are several others about 36 inches wide. The largest belt is for one of the large factories belonging to the Standard Oil Company, and special care has been taken to make the belt as perfect as possible. It is made of three strips of equal width, the whole being made up from pieces cut out of the centers of hides. The various sections that form the belt are cemented and riveted in a very substantial manner, with lap joints. The makers claim special credit for making this with top and bottom thicknesses all made from the centers of hides, since it secures perfect uniformity of strength. There are several belts in the factory for electric lighting companies, the firm making a specialty of belts adapted for such purposes.

The mines at Tracy City, Grundy county, Tenn., are the most extensive coal mines in the State. They are operated by the Tennessee Coal, Iron, and Railroad Company, who also own furnaces located, one at Cowan and two at South Pittsburgh. These furnaces take, virtually, all the coke burnt at Tracy City from 404 ovens, representing an output of 20,000 bushels or 400 tons daily. This quantity of coke represents 800 tons of coal mined, and with their shipments of, say, 450 tons of coal, make their daily output of coal 1,250 tons. This company employs near 700 men, besides over 500 convicts from the State prison, or a total of 1,200. This number will probably be increased next fall and winter to over 1,500 men. All of these, however, are not employed in or near the mines. The company owns twenty-five miles of railroad and rolling stock, and operates repair shops at Tracy City. Their machine shop, built of contiguous sand rock, is a model building for convenience and neatness.

Machinists' Supplies and Iron.

NEW YORK, August 21, 1884.

The condition of the supply trade remains unchanged.

Iron—The demand for American pig remains dull and inactive. The attempt to form a combination to close furnaces for a few weeks has had no influence in making buyers invest in more stock than is required for their immediate needs. No. 1 X Foundry is nominally quoted at $19.50 to $20 at tidewater. No. 2 X Foundry is held at $18 to $18.50. Grey Forge $16 to $17, but values rule in buyers' favor.

Scotch pig—Business drags very slowly, with no more demand than what is unavoidable. We quote Shotts, $21.50 to $21.75; Coltness, $21.50; Summerlee, $20.50; Eglinton, $19.50.

The demand for ingot continues light, sales being closely confined to retail operations. Lake is nominally quoted at 14c.; Western brands 12¾c. to 13¼c.

Tin—The price of pig has declined in consequence of heavy arrivals. Banca, for jobbing lots, is quoted at 20½c.; Straits and Malacca 18.50 to 18.75c.

✲WANTED✲

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—First-class mechanic, on fine, light machinery. Joseph Boyer, St. Louis, Mo.

Mech. engineer and draughtsman desires situation. Machine tools a specialty. Box 3, AM. MACHINIST.

Wanted—A situation by a first-class pattern mk'r. Good references. Address Box 5, Fitchburg, Mass.

Mech. eng'r and draughtsman of large and varied experience desires engagement. Mining machinery and general work preferred. Box 2, AM. MACHINIST.

Mechanical engineer and practical machinist, with large experience as superintendent and manager of a general foundry and machine business, is open to engagement. Address X., AM. MACHINIST.

Wanted, for the Pacific Coast—A skilled manager in a machine business, must have successful experience and be not less than 35 years old. Address, giving experience and references, "Pacific," AM. MACHINIST.

Wanted—A reliable man, to teach apprentices in machine-shop practice and machine draughting. A general education and a good character are necessary. Address S., AM. MACHINIST, stating age, experience, and pay previously received.

Wanted—A traveling salesman for the Chicago house of an Eastern manufacturing company. He should have, in addition to ability as a salesman, some knowledge of mechanical drawing, an aptitude for mechanics, and some familiarity with machinery; while his occupation will be principally selling a line of machinery, he will also be required to handle such other of the company's products as may be desired. Address, stating age, whether married, previous experience, salary expected, and references. C., office of AM. MACHINIST.

Small yacht and horizontal engine castings. Send stamp for price-list. J. L. Lucas, Waterbury, Conn.

For Sale—One Worthington Steam pump, nearly new, in perfect order; size 4½x2¾x4, No. 13,349. Will be sold low if applied for soon. Address Wm. H. Clapp, Weymouth, Mass.

Wanted—Parties traveling and selling to steam users, or dealing in mill supplies, to take the agency of a good and fast-selling article. Good inducements offered. Address "Manufacturer," care of AM. MACHINIST.

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Tables of the principal speeds occurring in mechanical engineering, expressed in mètres in a second. By P. Keerayeff. Translated by Sergius Kern. Price, 20 cents. Descriptive catalogue of books, 100 pages, free.

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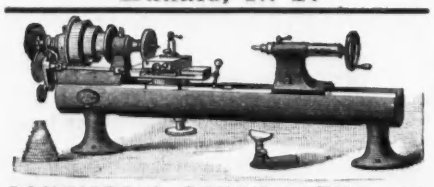

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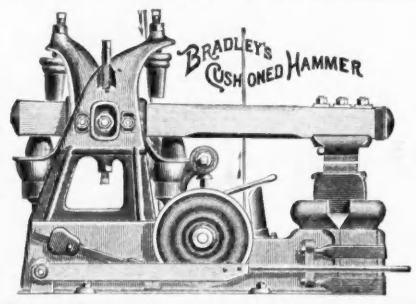

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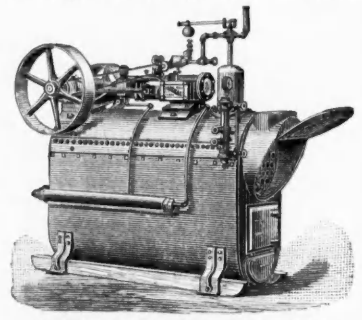

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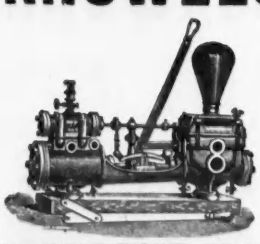

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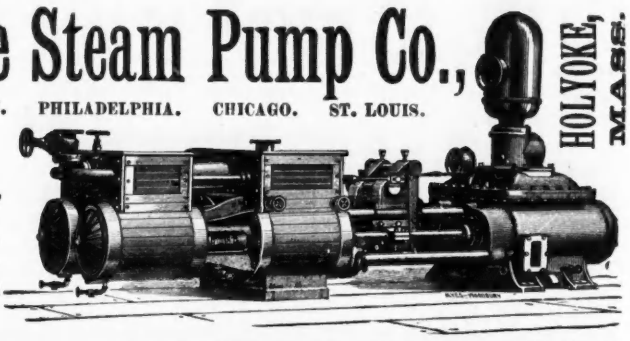

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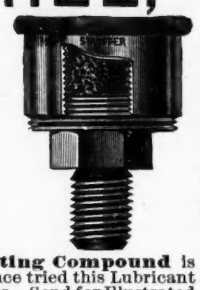

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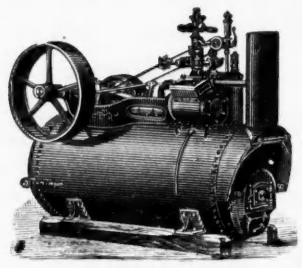

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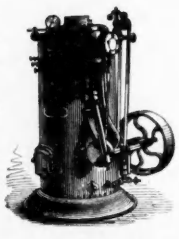

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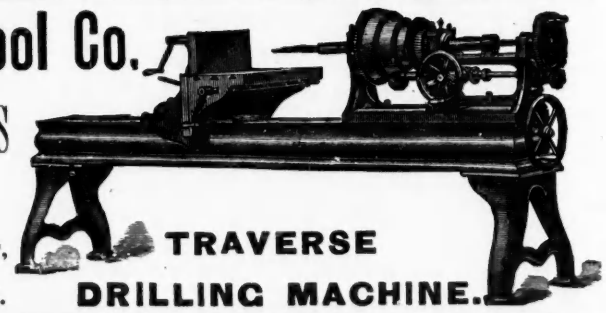

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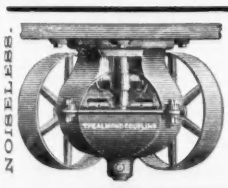

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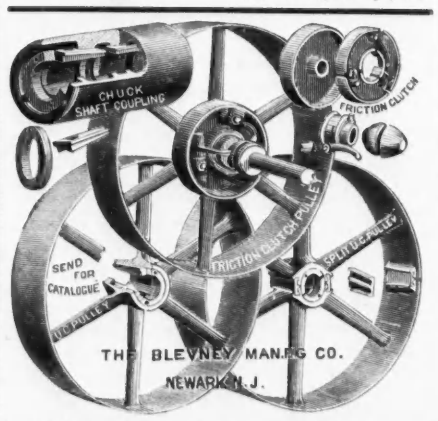

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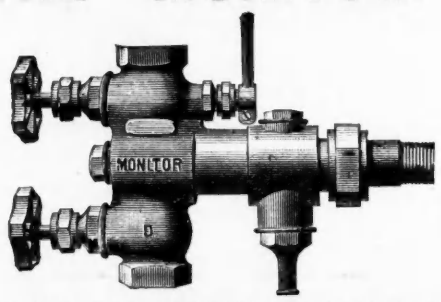

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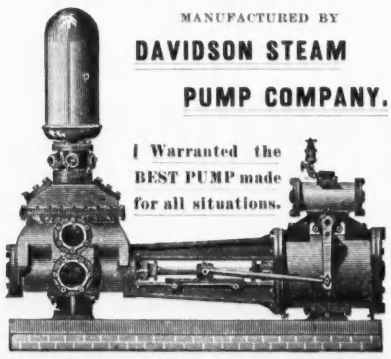

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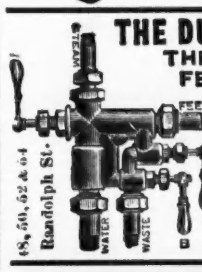

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" 9	1 2-8 "		1.10
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" 11	1 3-4 "		1.25
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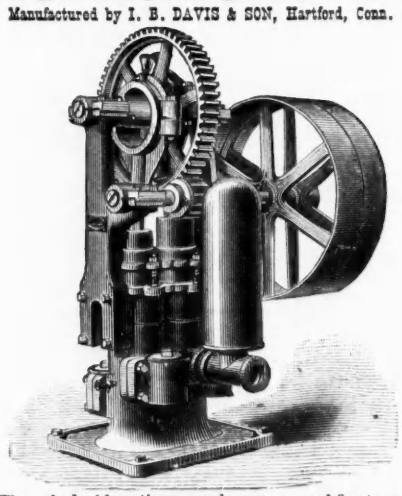

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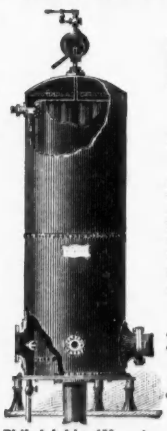

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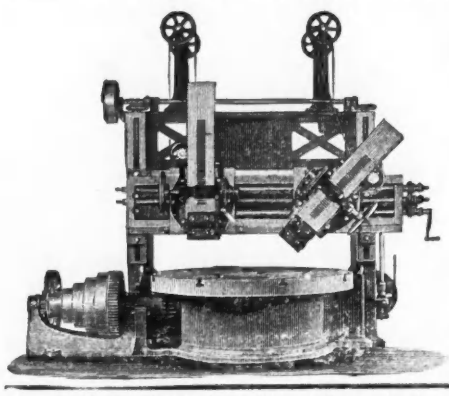

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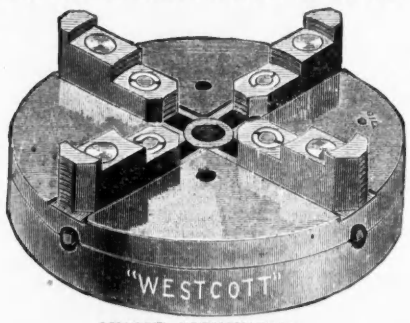

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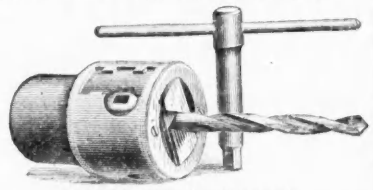

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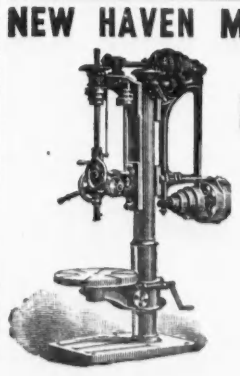

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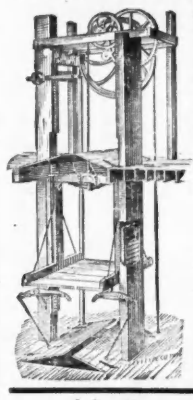

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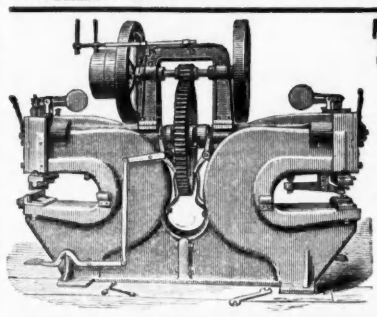

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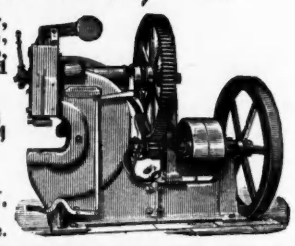

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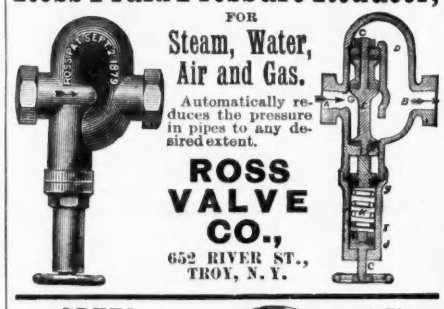

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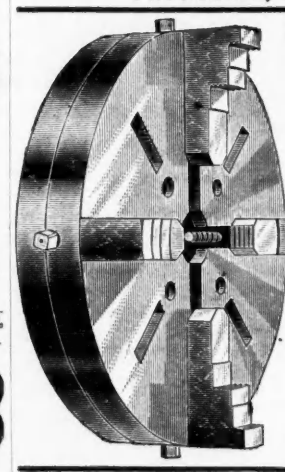

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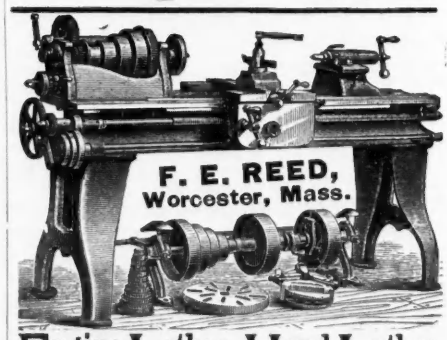

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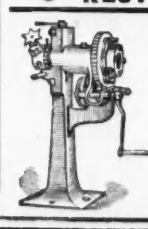

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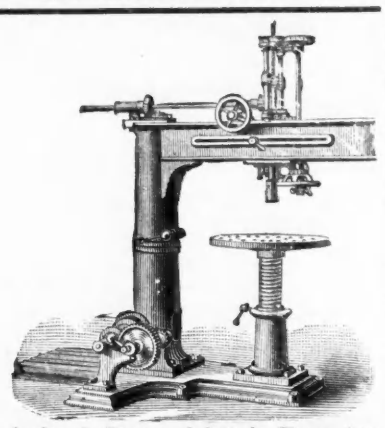

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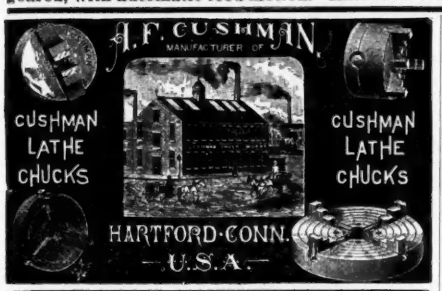

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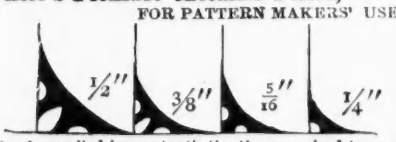

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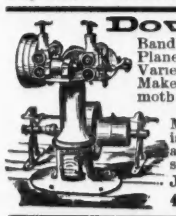

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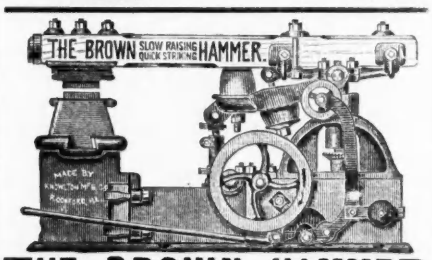

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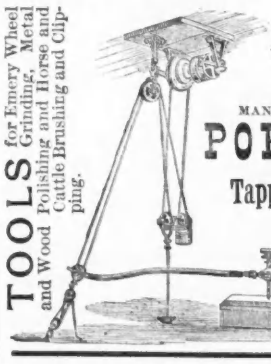

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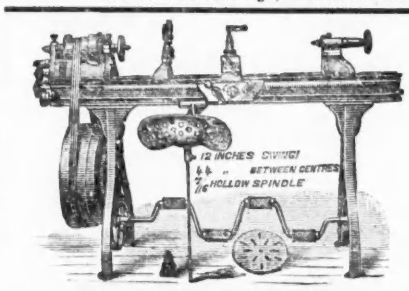

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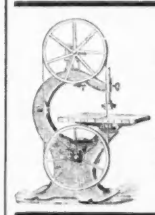

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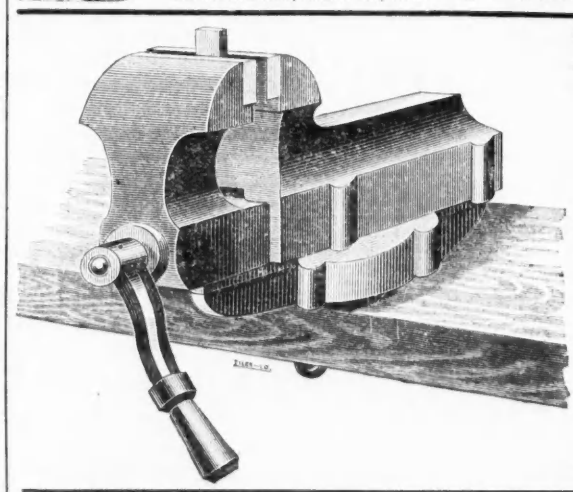

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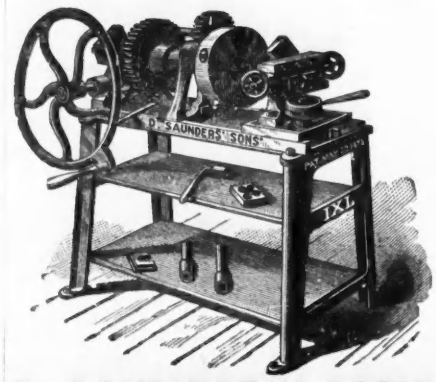

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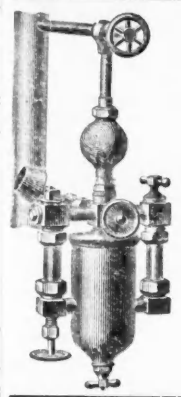

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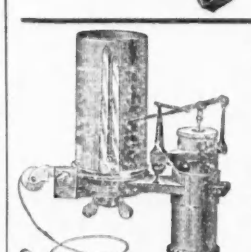

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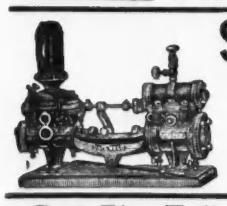

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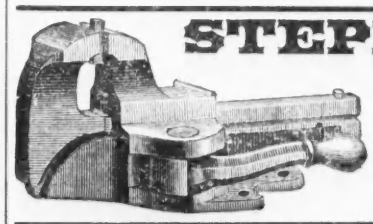

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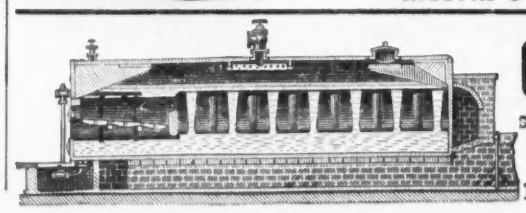

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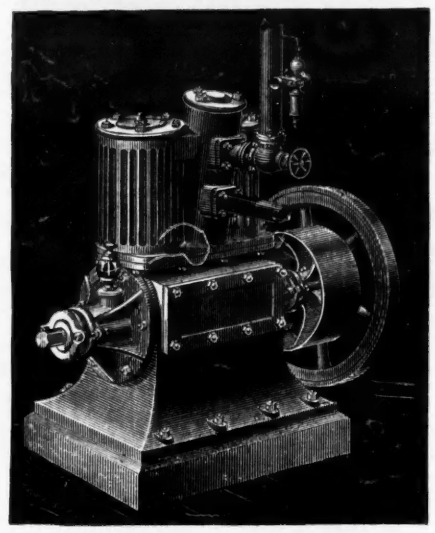

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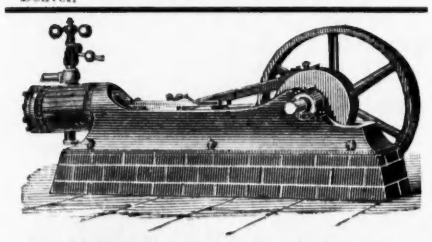

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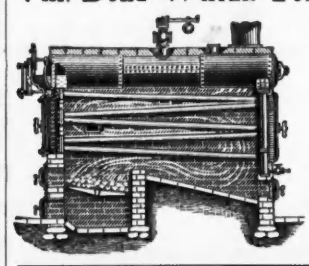

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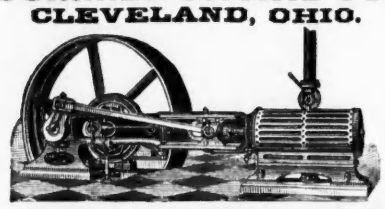

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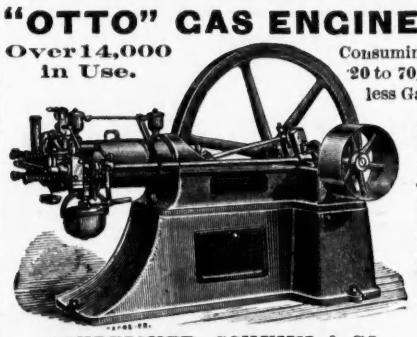

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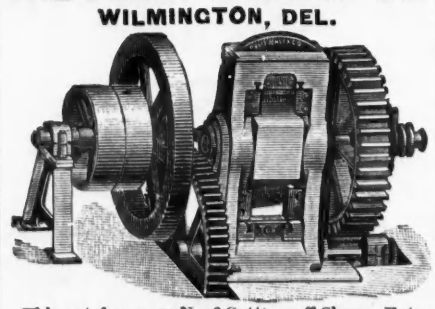

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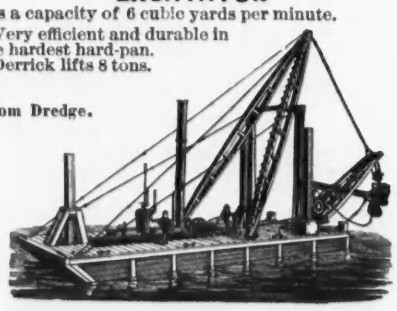

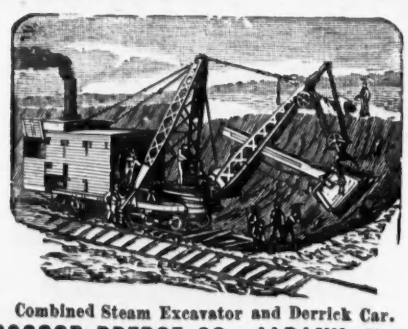

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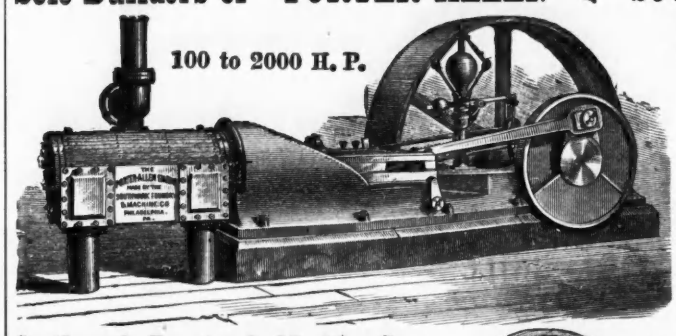

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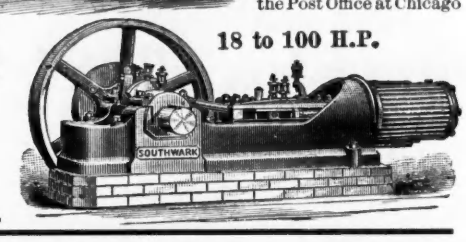

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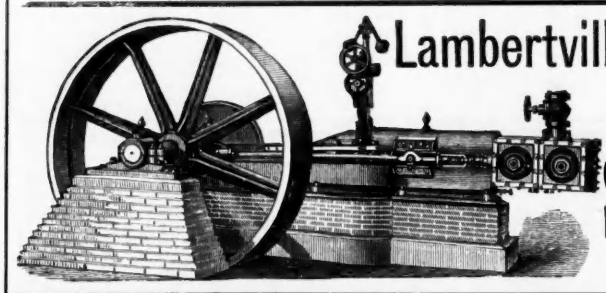

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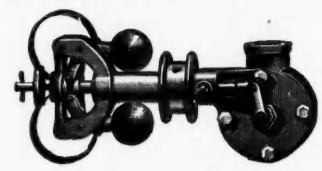

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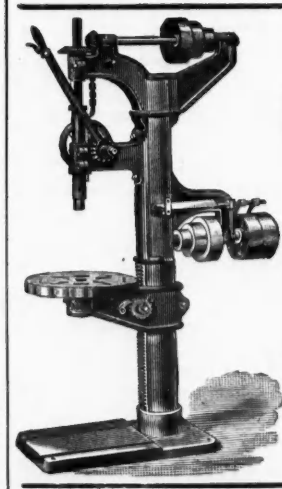

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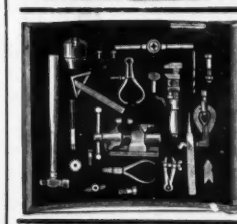

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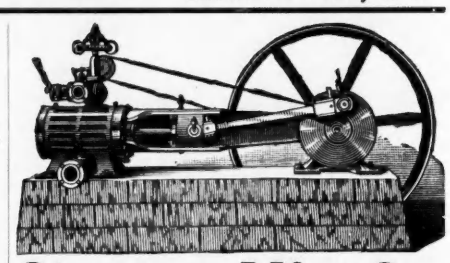

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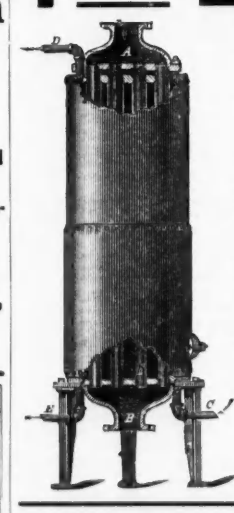

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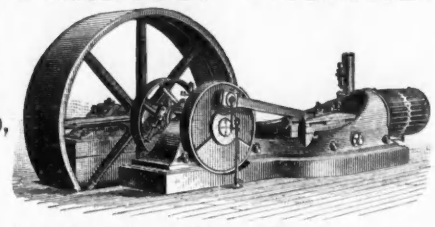

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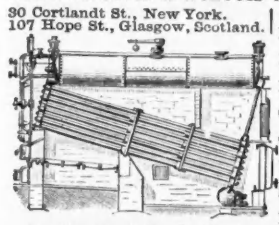

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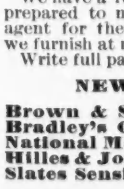

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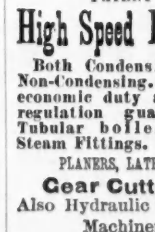

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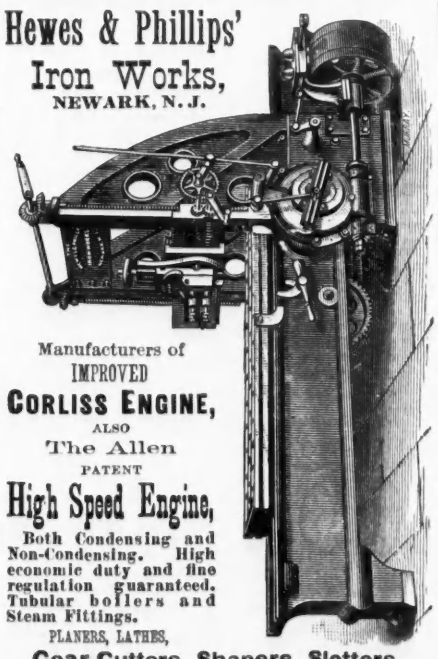

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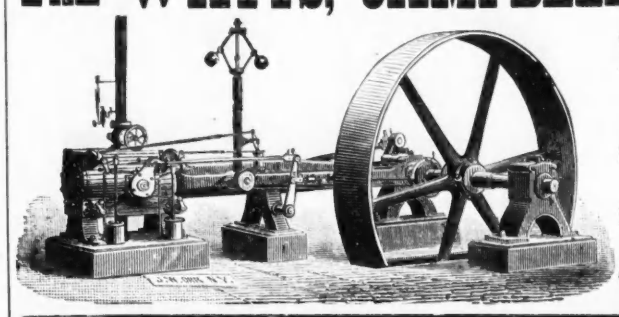

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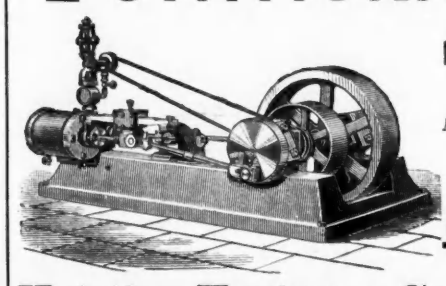

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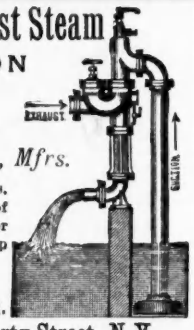

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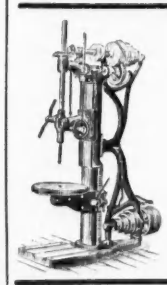

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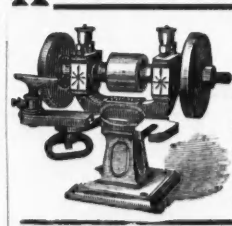

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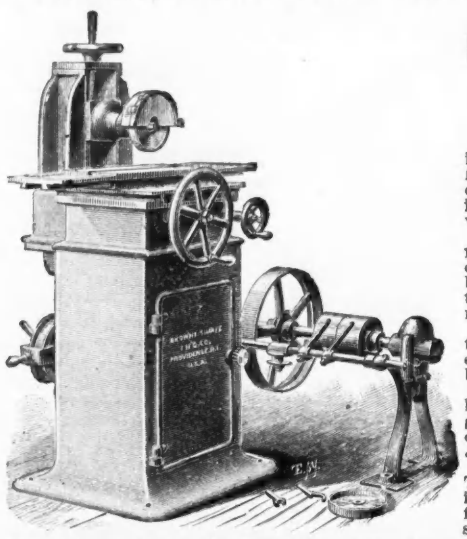

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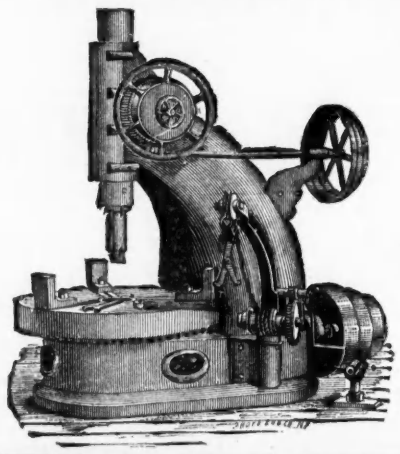

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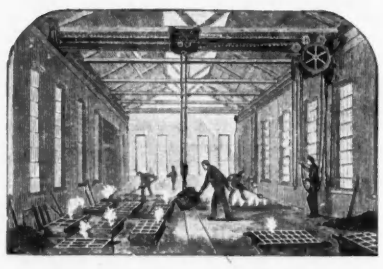

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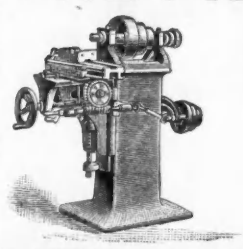

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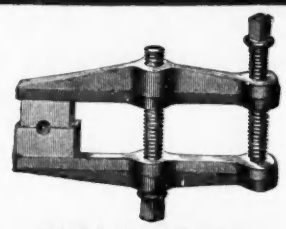

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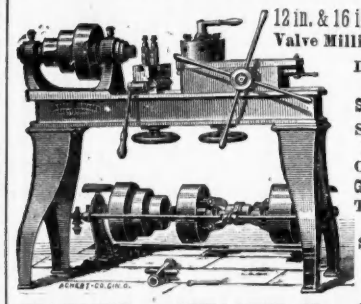

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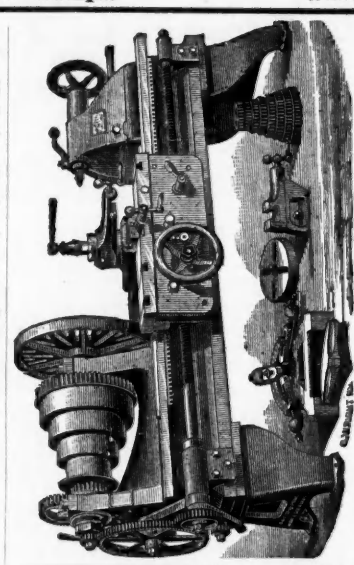

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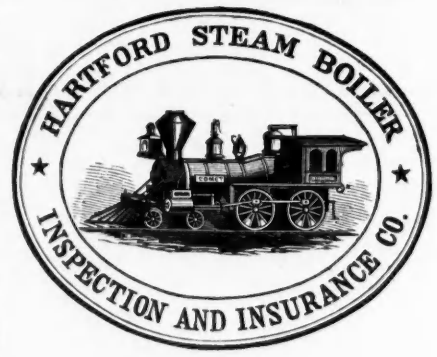

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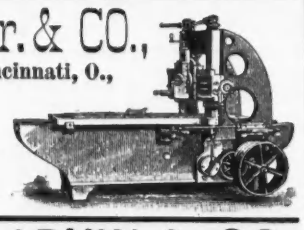

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Gentlemen:—In regard to the 26 in. x 26 in. x 8 ft. planer bought of you some time ago, it gives us pleasure to say that it is the best planer we ever saw. The man we have on it says it "Takes the cake," being the best he has run during the thirty years he has been running planers. We are well pleased with our purchase, and no other planer would fill our orders, and we will have no other.

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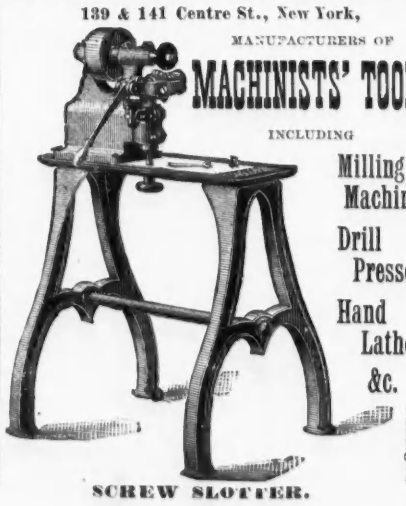

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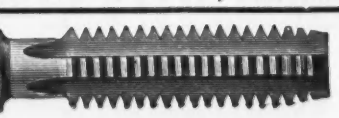

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